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ROHDE (T.). **Das Vordringen der Rhabdocline-Schütte in Deutschland. Die Folgen des Rhabdocline-Befalls in deutschen Douglasienbeständen. Welche Douglasien sind in Deutschland durch Rhabdocline gefährdet?** [The advance of the *Rhabdocline* leaf fall in Germany. The results of the *Rhabdocline* attack in German Douglas Fir stands. Which Douglas Firs are jeopardized in Germany by *Rhabdocline*?]—*Forstarchiv*, viii, 14, pp. 247–249; 18, pp. 317–326; 22, pp. 389–392, 5 figs., 3 diags., 5 graphs, 1 map, 1932.

An attempt has been made at the Hann.-Münden Botanical Institute to ascertain the distribution of the leaf fall (*Rhabdocline*) [*pseudotsugae*] of Douglas firs [*Pseudotsuga taxifolia*] [*R.A.M.*, xii, p. 63] in Germany and the date of primary infection. In May, 1932, some 25 silvicultural districts had been reported to the Eberswalde College of Forestry (according to an oral communication from Prof. J. Liese) as infected by this disease, chiefly in Pomerania, Mecklenburg, Brandenburg, and Silesia [ibid., xi, p. 141]. Prof. v. Tubeuf states that two areas are infected in Lower Franconia and three in the Palatinate. Primary infection is thought to date from 1922.

The incidence of attack by *R. pseudotsugae* has been found to vary considerably in different seasons. In 1931 a temporary decline of infection was observed in many cases. Meteorological studies are desirable in this connexion. Trees subject to persistent infection showed a marked shortening of the annual height increments and narrowing of the annual rings. So far it has not been possible to determine the length of time elapsing between primary infection and the death of a tree, but there is reason to believe that this is considerable. There is no question at present of the imminent destruction of entire stands by the leaf fall disease.

Discussing varietal reaction to *R. pseudotsugae*, the writer agrees with the general view that the blue and grey (*glauca* and *caesia*) varieties are more susceptible than the green (*viridis*), but the differences, in his opinion, are not very great. The green varieties do not appear to be completely immune, nor are the blue and grey ones so extremely susceptible as is frequently reported. Most of the infected stands were found to range from 13 to 37 years of age, the greatest liability being from 15 to 30 years; only in one

area in the extreme north-west were two-year-old seedlings attacked. No indication has yet been obtained of the superiority, in respect of freedom from leaf fall, of mixed over pure Douglas fir stands.

TUBEUF [C. v.]. **Rhabdocline-Erkrankung an der Douglasie und ihre Bekämpfung.** [*Rhabdocline* disease of the Douglas Fir and its control.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xlii, 9, pp. 417–426, 7 figs., 1932.

The writer briefly summarizes the available knowledge on the life-history and mode of infection of *Rhabdocline pseudotsugae*, which has been detected in a few localities of North Germany on Douglas fir [*Pseudotsuga taxifolia*: see preceding abstract]. An urgent plea is made for the strict regulation of the importation of conifers, nursery inspections, and the extended cultivation of the resistant green [*viridis*] varieties.

WOLLENWEBER (H. W.) & RICHTER (H.). **Die Douglasienschütte und ihr Erreger, Rhabdocline pseudotsugae Syd.** [The leaf fall of Douglas Firs and its agent, *Rhabdocline pseudotsugae* Syd.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xii, 9, pp. 71–74, 4 figs., 1932.

A concise account is given in semi-popular terms of the distribution, symptoms, life-history, course of infection, and control of *Rhabdocline pseudotsugae*, the agent of leaf fall of *Pseudotsuga taxifolia* in Germany and elsewhere [see preceding abstracts], with notes on varietal susceptibility.

GEYR (H. v.). **Nochmals: Rhabdocline.** [To return to *Rhabdocline*.]—*Forstarchiv*, viii, 14, pp. 241–245, 1932.

The writer maintains his standpoint, in opposition to v. Tubeuf and Liese [*R.A.M.*, xi, p. 141], that the best method of combating the Douglas fir [*Pseudotsuga taxifolia*] leaf fall (*Rhabdocline*) [*pseudotsugae*: see preceding and next abstracts] in Germany is by the gradual development of resistant or immune varieties. For this purpose the establishment of special official nurseries is advocated, one in eastern and another in western Germany, in which prospective planting material, mainly of the north-eastern grey [var. *caesia*] type, could be thoroughly tested by exposure to infection through contact with susceptible varieties. The proposed legislative measures would necessarily put a bar to this project, in which the writer sees the most feasible means of overcoming the disease.

LIESE (J.). **Bemerkungen zu vorstehenden Ausführungen.** [Comments on the foregoing observations.]—*Forstarchiv*, viii, 14, pp. 245–247, 1932.

The establishment of special nurseries for the development of Douglas fir [*Pseudotsuga taxifolia*] varieties immune from *Rhabdocline* [*pseudotsugae*: see preceding and next abstracts] is not regarded by the writer as a practicable control measure. It is improbable that seedlings would contract infection from neighbouring centres of disease, the youngest trees hitherto observed by the writer to be attacked being 15 to 16 years old. The danger

that if the fungus is allowed to multiply the hitherto immune green varieties [*viridis*] may become liable to infection by new physiologic forms of the fungus makes the immediate felling of diseased trees advisable.

GEYR (H. v.). **Rhabdocline-Bekämpfung.** [*Rhabdocline* control.]—*Forstarchiv*, viii, 18, pp. 326–327, 1932.

Liese's objections to the establishment of nurseries for the cultivation of Douglas firs [*Pseudotsuga taxifolia*] immune from *Rhabdocline* [*pseudotsugae*: see preceding abstracts] are discussed and refuted. The possibility of the evolution of new physiologic forms of the fungus is regarded as remote. Quite young trees are stated to become infected in America. It would, however, be quite possible to let the trees grow to a certain size before infecting them, thereby curtailing the period of sporulation.

BADOUX (J.). **Nouvelle épidémie de la rouille des aiguilles de l'Épicea.** [A new rust epidemic on Spruce needles.]—*Journ. Forest. Suisse*, lxxxiii, 9–10, pp. 232–233, 1932.

A fresh outbreak of the spruce rust due to *Chrysomyxa abietis* (*C. rhododendri*) [*R.A.M.*, xi, p. 553], which caused such heavy damage in Switzerland in 1927 [cf. ibid., vii, p. 686], has recently been recorded from Valais, Oberland, and St. Gall. The attacks are stated to be of intense severity and clouds of orange spores have been blown about by the wind.

LINDGREN (R. M.). **Field observations of needle rusts of Spruce in Minnesota.**—*Plant Disease Reporter*, xvi, 12, pp. 126–129, 1932. [Mimeographed.]

A needle rust of spruce occurred in epidemic form in Minnesota forest nurseries during the summer of 1927, the most susceptible species being *Picea mariana* and *P. pungens* var. *engelmanni*, followed in decreasing order by *P. glauca* and its var. *albertiana* and *P. excelsa*. Defoliation amounted to between a quarter and three-quarters of the current year's needles in severe attacks. Later on heath plants growing near the infected spruce stands bore the uredo stage of *Melampsoropsis* [*Chrysomyxa*] *cassandrae* on *Chamaedaphne calyculata* and of *M. abietina* [*C. ledi*] and *M.* [*C.*] *ledicola* on *Ledum groenlandicum*. Of these the first-named was the most prevalent, while *C. ledicola* appeared to be of little account. *Andromeda glaucophylla* was also found in some cases to bear uredospores in the neighbourhood of the infected spruce. The relation between *C. cassandrae* and *Peridermium consimile* on spruce was shown by Clinton (*Ann. Rept. Connecticut Agric. Exper. Stat.*, 1907–8, p. 369), while the other two species were shown to infect spruce by Fraser (*Mycologia*, iii, pp. 67–74, 1911). The aecidial stages of all three rusts on spruce needles are very difficult to distinguish morphologically. A small number of inoculation tests from spruce on *L. groenlandicum* and *C. calyculata* supported field observations on the relative prevalence of the rusts.

GILL (L. S.). **Notes on the pycnial stage of Peridermium cerebroides.**—*Mycologia*, xxiv, 4, pp. 403–409, 3 figs., 1932.

In this paper the author reports the first discovery in 1930 in

the Santa Cruz Mountains, California, at an altitude of about 1,500 feet, of the pycnidial stage of *Peridermium* (?) *cerebroides* [*R.A.M.*, viii, p. 684] on *Pinus radiata* and *P. attenuata*. The pycnidia were only found on young galls, lying just below the periderm of the host, during the winter months. They were rare and considerably smaller than those of *P. cerebrum* [loc. cit.]. The sorus appears to be borne on a uninucleate mycelium, and in most of its morphological details it agrees with similar structures typical of the caulicolous species of *Peridermium*.

LIESE [J.]. **Merkblatt zur Schüttebekämpfung.** [Memorandum on leaf fall control.]—*Merkbl. Hauptstelle forstl. Pflanzensch. Eberswalde*, Bot. Ab., 4 pp., 2 figs., J. Neumann, Neudamm, [? 1932. Abs. in *Forstwissensch. Centralbl.*, liv, 20, p. 715, 1932.]

A pamphlet dealing with leaf fall of pines [*Lophodermium pinastri*] and its control [*R.A.M.*, xi, p. 486] in Germany has been prepared by the writer to replace v. Tubeuf's publication on the subject, written in 1905 and now out of print. Notes on some of the new copper-containing fungicides are included.

FINDLAY (W. P. K.). **A study of Paxillus panuoides Fr. and its effect upon wood.**—*Ann. of Appl. Biol.*, xix, 3, pp. 331–350, 3 pl., 2 figs., 1 graph, 1932.

This is a full account of the cultural and biological study of *Paxillus panuoides*, a summarized report of which has already been noticed [*R.A.M.*, xi, p. 448]. Additional points of interest are that, in pure culture on 2 per cent. malt agar with 1 per cent. malic acid, the fungus grew within a restricted range of temperature, with a lower limit at about 5° and an optimum between 23° and 25° C., while no growth occurred above 29°. It grows best on acid media and can grow on malt agar acidified to P_H 2. It was shown to be very sensitive to antiseptics, indicating that its growth may readily be checked by a low concentration of an efficient wood preservative [cf. ibid., xi, p. 816]. No evidence of the presence in its mycelium of an oxidase or peroxidase was obtained, the predominating enzyme appearing to be hydrolytic in nature. The paper terminates with a brief description of macroscopical details permitting of the identification of the timber decay due to *P. panuoides* (which causes a brown rot affecting mainly the cellulose and leaving the lignin practically untouched), and with some suggestions for its control.

Intelligence and minor investigations.—*Dept. Sci. & Indus. Res., Rept. Building Res. Board for the year 1931*, pp. 104–145, 1932.

Among the special problems investigated by the Building Research Board in 1931 was the liability of wooden floors to develop dry rot [*Merulius lacrymans*: *R.A.M.*, xi, pp. 343, 487] when laid direct on concrete. A very large number of cases of decay of floors from this cause has been reported, and the common use of impermeable linoleums prevents the drying out of the moisture rising from below. Only a completely impervious layer of bitumen is likely to prove satisfactory in checking the ascent of

moisture from the ground, the efficacy of brush-applied coatings of preservative on the floor timbers being very doubtful unless made with extreme care. Instances have been observed in which the fungus gained access to surface-treated timber by way of cut ends and cracks, completely destroying the interior of the wood and leaving a shell of unattacked substance.

ROBAK (H.). **Investigations regarding fungi on Norwegian ground wood pulp and fungal infection at wood pulp mills.** —*Nyt Magazin for Naturvidenskaberne*, B, lxxi, pp. 185–330, 32 figs., 1932.

A comprehensive and fully tabulated account is given of the author's investigations from 1929 to 1931 on the part played by fungi in the deterioration of wood pulp before and during storage in Norwegian mills. The main object of the work was the systematic study of the fungi concerned, but some tentative observations are made as to the possible sources of infection (air rather than the timber or water being the most prolific) in relation to storage methods and other practical aspects of the problem.

Pure cultures were made of over forty organisms isolated from pulp samples, and detailed morphological descriptions are given of 28, including five new species, viz., *Myxotrichum carminoparum*, *Ceratostomella stenoceras*, *Oidiodendron nigrum* n. g., n. sp., *O. fuscum*, and *O. rhodogenum* (with Latin diagnoses). The new genus is characterized by slender, septate hyphae which are hyaline when immersed, but may darken in the aerial growth, and well-differentiated, erect, arborescent conidiophores, the branches of which divide up into oval to round, unicellular, coloured or hyaline spores. Although *O. nigrum*, by reason of its brown aerial hyphae and dark conidia, belongs to the Dematiaceae as generally understood, while *O. rhodogenum*, with pale conidia and hyaline mycelium, is a member of the Mucedineae, the separation of the three naturally connected forms under discussion is considered to be impracticable.

Other important species detected in the 54 'air analyses' made at two mills, in which Petri dishes containing wort agar were placed for one hour or one day, included *Cladosporium herbarum* (31), *Trichoderma lignorum* (27), *Hormonema pullulans* (23), *Cadophora fastigiata* (14) [*R.A.M.*, xi, p. 14], and B 7, a rapidly growing, unidentifiable, sterile, pale scarlet mycelium (14).

Conspicuous changes in the colour of the pulp were produced by *M. carminoparum*, mycelium B 7, and *O. rhodogenum* in the form of diffusible, red pigments, while *H. pullulans*, *C. fastigiata*, *Cladosporium herbarum*, and to some extent *Discula pinicola* var. *mammosa* [ibid., ix, p. 76] cause dark staining. None of the 35 species found on manufactured wood pulp affected the consistency of the material during a period of six to twelve months. The fibres were slightly attacked by *Epicoccum purpurascens* [ibid., xi, p. 737], *O. nigrum*, and *O. rhodogenum*, but in a general way it may be concluded from these investigations that the moulds contaminating wood pulp are not of a destructive order.

McBride (J. S.). **Thirty-two years' experience with treated ties.**—*Railway Engin. & Maintenance*, xxviii, 2, pp. 111–112, 1932.

The preservation of sleepers was first carried out on a large scale by the Chicago and Eastern Illinois Railway in 1899. Burnettizing by zinc chloride [*R.A.M.*, viii, p. 4] has been employed since 1906 and treatment with creosote oil since 1907. From 1907 to 1914 creosote and zinc chloride were used in about equal proportions, but during the war creosote became very scarce. Since 1924, however, it has been exclusively used and is now the standard preservative on the Railway [cf. ibid., xi, p. 685 and next abstract]. Most of the sleepers are of red oak [*Quercus rubra*] which is readily impregnated.

The average annual renewals during the past 15 years have been 4·09 per cent. of the total sleepers on the track, indicating an average life of 24·4 years, against an average life of 9·78 years in a test of 11,095 untreated sleepers established in 1918.

Van Ness (R. A.). **After fifty-seven years.**—*Railway Engin. & Maintenance*, xxviii, 5, pp. 329–331, 1 fig., 1932.

Constructional timber preservation was initiated on the Santa Fé Railway in 1875, when piles for the timber trestle bridge in Galveston Bay were treated with creosote [see preceding abstract]; some of these lasted for 20 years. The two oldest creosote-treated timber bridges on the railway were constructed in 1899 on the main line in Missouri, and it is estimated that the deck timbers of these are good for another 10 or 15 years. Practically all bridge timber now undergoes treatment. Between 1885 and 1931 the Santa Fé Railway impregnated some 300,134,000 board ft. of timber, of which 90 per cent. was for bridges, while during the same period about 14,700,000 linear ft. of piling was treated. Bridge timbers are now treated with an 8 lb. creosote mixture by the Rueping process [*R.A.M.*, xi, p. 815], southern pine [*Pinus palustris*, *P. taeda*, &c.] being impregnated with 14 lb. creosote per cu. ft. and Douglas fir [*Pseudotsuga taxifolia*] being treated to refusal (13 lb. with the aid of incision). Experiments are in progress with a 50–50 mixture of creosote and asphaltic or residue petroleum whereby all piling may be impregnated up to 18 lb. per cu. ft. This mixture is sufficiently toxic to wood-rotting fungi and the viscosity of the oil tends to retard the evaporation of the creosote. In order to prevent the decay of piling at the tops, the cut surfaces are sealed with creosote and heavy oil and the tops covered with two-ply roofing paper nailed down to the sides. Field holes in the timber, which were also found to be causing rot, are swabbed with hot creosote and a sealing compound.

Crosby (C. R.) & Chupp (C.). **The control of diseases and insects affecting vegetable crops.**—*Cornell Agric. Exper. Stat. Extens. Bull.* 206, 99 pp., 11 figs., 1931. [Received September, 1932.]

Practical directions are given in popular terms for the control of the principal diseases and pests of the following vegetables in New

York State: cabbage and related crops, beans, peas, spinach, beet, lettuce, cucurbits, onion, tomato, carrot, celery, asparagus, and sweet corn. Notes are also given on the control of some seed-bed diseases, and on the preparation of various insecticides and fungicides.

BURKHOLDER (W. H.) & CROSBY (C. R.). **Diseases, and insect and other pests, of the field Bean in New York.**—*Cornell Agric. Exper. Stat. Extens. Bull.* 58, 38 pp., 24 figs., 1932.

This revision of a bulletin published in 1923 contains popular notes on the symptoms, etiology, and control of the following bean [*Phaseolus vulgaris*] diseases in New York State: anthracnose (*Colletotrichum lindemuthianum*), to which the Nova Scotia and Perry Marrows, Wells's Red Kidney, and White Imperial have been found resistant [*R.A.M.*, xi, p. 618]; bacterial blight (*Phytomonas* [*Bacterium*] *phaseoli*) and other organisms [*Bact. flaccumfaciens*, *Bact. medicaginis* var. *phaseolicola*, *Bact. phaseoli* var. *fuscans*, *Bact. vignae* var. *leguminophila*, and *Bact. viridiflava*: ibid., ix, p. 695]; mosaic, commonly affecting the White Pea, Otenashi, Burlingame, and Blue Pod Medium varieties, White Marrow, Yellow Eye, and Kidney being less severely injured [ibid., xi, p. 499]; dry root rot (*Fusarium martii phaseoli*) [ibid., xi, p. 556], to which Yellow Eye is very susceptible, while a resistant non-commercial variety known as Flat Marrow has given promising results in hybridization trials; black root rot (*Thielavia basicola*) [ibid., iv, p. 136]; *Rhizoctonia* blotch; rust (*Uromyces appendiculatus*); and *Sclerotinia* rot (*S. libertiana*) [*S. sclerotiorum*].

KADOW (K. J.) & JONES (L. K.). **Fusarium wilt of Peas with special reference to dissemination.**—*Washington Agric. Exper. Stat. Bull.* 272, 30 pp., 4 pl. (1 map), 1932.

The wilt of peas caused by *Fusarium orthoceras* var. *pisi* is stated to be the most destructive disease at present occurring on this crop in the United States [*R.A.M.*, xi, p. 86]. Other hosts of the fungus are *Vicia gigantea*, a native perennial vetch from California and Nevada, and Sutton's New Giant broad bean (*V. faba*).

Temperature and the simultaneous presence of certain soil fungi, e.g., *Alternaria* and *Cladosporium* spp., appear to be the most important factors directly affecting the occurrence of wilt. Under western conditions the disease is prevalent at soil temperatures up to 88° F. The fungus is seed-borne. Dissemination is effected by farm implements and also by wind. The disease does not seem to cause appreciable damage until at least a year after its introduction into a field. Semesan seed treatment is ineffectual once the fungus has become established in the soil, though it inhibits infection by *F. martii* var. *pisi* and other secondary organisms. The use of such resistant varieties as Green Admiral, Horal, Prince of Wales, Senator, Bruce, First of All, Dwarf Telephone, and Giant Butter is the sole reliable means of avoiding wilt.

DOYER (L[UCIE] C.). **Möhrensamen.** [Carrot seed.]—*Nachricht. über Schädlingsbekämpf.*, vii, 3, pp. 107–109, 1 fig., 1932.

In this paper (which originally appeared in *De Veldbode*, Maastricht, 27th February, 1932), the writer draws attention to the frequent contamination of Dutch carrot seed by *Alternaria radicina* [*R.A.M.*, x, p. 327], good control of which, combined with increased germination, was given by disinfection with 0·25 per cent. uspulun, ceresan, or tillantin R.

Mushroom-growing.—*Min. of Agric. & Fish. Bull.* 34, 28 pp., 8 figs., 2nd edn., July, 1932.

This bulletin, first issued in October, 1931, and intended to replace the Ministry's leaflet No. 276 on 'Commercial Mushroom Cultivation', has been prepared with the co-operation of various experts, including W. M. Ware and W. F. Bewley. The section on cultivation comprises notes on different types of spawn (virgin, brick, and pure culture), the purchase of spawn, choice and preparation of manure, indoor and outdoor culture, making and management of beds, spawning, casing or soiling, and outdoor culture in pastures and the like. Notes are given on diseases and pests, including 'mushroom disease' or 'bubbles' (*Mycogone perniciosa*, *Cephalosporium costantinii*, and *Verticillium* sp.) [*R.A.M.*, xi, p. 493], 'gill mildew' or 'flock' (*C. lamellaecola* and *V.* sp.), brown blotch of the caps (*Pseudomonas tolaasii*) [ibid., xi, p. 764], plaster mould (*Oospora fimicola*), and the mushroom-bed *Sclerotium* (*Xylaria vaporaria*) [ibid., x, p. 8].

A 5-page bibliography is appended.

RAVAZ (L.). **Chronique. Mildiou—rot gris—rot brun.** [Current events. Mildew—grey rot—brown rot.]—*Prog. Agric. et Vitic.*, xcviii, 28, pp. 29–34, 1 col. pl., 1932.

Heavy rains on 19th and 20th June, 1932, were followed, as predicted by the Meteorological Station in Montpellier, on 26th and 27th of the same month by a severe invasion of all unsprayed vineyards in the south-west of France by *Plasmopara viticola* [*R.A.M.*, xi, p. 622]. This outbreak gives occasion to the author to stress once more the importance of spraying the vines not more than five days in advance of the date foretold for the threatened invasion, and to point out that the closer the spraying is made to that date the better the protection given to the vine. He also gives a brief description of the attack of the fungus on the grape bunches, causing grey rot when the flowers and fruit are infected, and brown rot when the rachis and peduncles are the first to be infected and the fruit has already reached a fair size. An interesting observation is that the presence of a thick cover of weeds in the vineyards tends to minimize the spread and development of the disease during the vegetative period of the vine, an effect which, in his opinion, is due to the desiccating action of the weeds on the soil and indirectly on the vines. After the end of vegetation, the weeds retard the maturation of the grapes and should be removed.

RAVAZ (L.). **Chronique. Toujours le mildiou.** [Current events. Mildew still.]—*Prog. Agric. et Vitic.*, xcviii, 29, pp. 53–56, 1932.

This is a brief review of the vine mildew [*Plasmopara viticola*] situation in France up to the early part of July, 1932. The disease is stated to have been very severe in the south and south-west, chiefly owing to the heavy rainfall that occurred about 20th June [see preceding abstract], and to show a marked tendency to spread eastwards; the more central and western provinces, however, suffered from the disease to a much lesser extent, some districts escaping entirely up to July.

RAVAZ (L.). **Chronique. Le mildiou. Les bouillies. Les cépages sensibles.** [Current events. Mildew. Sprays. Susceptible varieties.]—*Prog. Agric. et Vitic.*, xcviii, 30, pp. 77–83, 1932.

The author briefly describes the further progress of the 1932 epidemic of vine mildew [*Plasmopara viticola*: see preceding abstracts] in France, mainly owing to the frequent rains that fell at the beginning of July and caused fresh outbreaks of the fungus every two or three days. In many cases the lime used by the growers in the preparation of the sprays contained a high percentage of carbonate of lime, resulting in the very poor adhesiveness of the sprays. Notes are also given on the relative susceptibility to the disease of the different varieties of vine, indicating that while those with glabrous leaves appear to be less easily infected before spraying, presumably owing to the fact that the spores are retained to a lesser extent by smooth than by tomentose surfaces, the protection against infection by the sprays is more effective on the former than on the latter. Some details are finally given of the condition of the vineyards in the middle of July in different regions of France.

MANZONI (L.). **Relazione sul funzionamento degli osservatori antiperonosporici della provincia di Treviso. Annate 1930 e 1931.** [An account of the functioning of the anti-mildew forecasting stations in the province of Treviso. Years 1930 and 1931.]—Reprinted from *Annuario Staz. Sper. di Vitic. di Conegliano, 1929–1931*, iii, 2, 41 pp., 1932.

Reviewing the data supplied from 1929–31, inclusive, by the stations set up in the province of Treviso, Italy, to forecast attacks of vine mildew [*Plasmopara viticola*: cf. *R.A.M.*, ix, p. 762], the author states that the outstanding feature was that any given locality constantly showed the same relative degree of infection at any given date in one year as in the other two, although the prevailing weather, seasonal conditions, and the general severity of the disease were markedly different in the three years. The data provided by the various stations were not such as to account for this, and the slight differences in temperature and rainfall between the different localities could not be responsible for wide differences in the degree of infection. Really bad weather was, as a rule, experienced equally in all districts, while short, heavy, summer showers were usually most frequent in the hilly regions; these

however, do not predispose to mildew. If there was any correlation between temperature, rainfall, humidity, and infection at any one station, the same correlation either did not hold for the others, or was very much less apparent. The figures for the relative atmospheric humidity, especially the amount of dew, are those likely to show the greatest degree of error, either because of differences in the instruments at the various stations, or because the readings are taken at rather different times (in the evening, one hour may make a difference of over 20 per cent.) or because the stations face towards different points of the compass. The figure for the relative humidity, taken at sunset, approximates to the daily maximum, which frequently reaches 100 per cent. over the entire province, and tends to be very high near soil level, when the weather is fine and the wind light, even at high altitudes.

The practical utility of a forecasting station evidently does not depend upon any correlation between the data it supplies and those supplied by other stations.

It is concluded that while mildew forecasting stations are likely to be of service in certain parts of the province, they would be of little value in those areas where there is a constant tendency to infection even in dry seasons. In the last-named districts the number of spray applications given could still be considerably reduced without danger, though, owing to the prevailing economic conditions, the growers are now much less prodigal of their copper sulphate than formerly [cf. ibid., viii, p. 150].

Voss. **Versuche mit Kupferkalk Wacker im Weinbau im Jahre 1931.** [Experiments with Wacker's copper-lime in viticulture in the year 1931.]—*Der Deutsche Weinbau, 1932*, 22, p. 174, 1932. [Abs. in *Neuh. auf dem Geb. des Pflanzensch., 1932*, 3-4, p. 93, 1932.]

Very good control of *Peronospora* [*Plasmopara viticola*] in the Trier [Treves, Rhine Province] vineyards was given in 1931 by Wacker's copper-lime [*R.A.M.*, x, p. 706] used at concentrations of 0·5 per cent. upwards, which proved fully equal to ordinary Bordeaux mixture in efficacy. For the present it is recommended to use the Wacker brand at a strength of 1 per cent. at the lowest.

Meyer (A.). **Recherches sur l'utilisation des matières colorantes organiques et de la 8-oxyquinoléine dans la lutte contre les maladies cryptogamiques de la Vigne.** [Researches in the utilization of organic dyes and 8-oxyquinoline for the control of cryptogamic diseases of the Vine.]—*Rev. de Vitic.*, lxxvii, 1991, pp. 117–120, 1932.

Brief details are given of continued experiments at the École de Viticulture de Beaune and by a small number of vine-growers in the Côte d'Or, to test the efficacy of organic dyes in the control of vine mildew [*Plasmopara viticola*: *R.A.M.*, xi, p. 622]. The investigation also included a copper salt of oxyquinoline, the preliminary results with which appear to be very promising. Of all the substances tested so far, oxyquinoline has been found to be the most effective under comparable conditions. The spreader used in

the tests was tibalène NAM at the concentration of 2 in 1,000, which experiments showed to be the best for practical purposes.

MARCHAL (P.) & FOËX (E.). **Rapport phytopathologique pour l'année 1931.** [Phytopathological report for the year 1931.] —*Ann. des Épiphyties*, xviii, 1, pp. 1–53, 1932.

This report on the phytopathological situation in France during 1931 is on the same lines as that for the previous year [*R.A.M.*, xi, p. 94] and contains, amongst others, the following items of interest apart from those already noticed from other sources.

Puccinia glumarum appeared on 27th March on wheat at Versailles, and owing to favourable weather conditions it had become very prevalent by 15th May. On 14th June *P. triticina* appeared on Alsatian wheat and attacked most of the other varieties so rapidly that by 17th June it was already becoming general. *P. graminis* appeared on 24th June, the attack becoming general on 8th July. A warm, dry period lasting from 20th June until 3rd July did not prevent attack by this rust. *Ophiobolus graminis* [ibid., xi, p. 503] was found on numerous wheat varieties in the vicinity of Paris, the attack being more important than that of 1930. *Cercosporella herpotrichoides* [loc. cit.], on the other hand, was less severe than in the previous year.

Phytophthora infestans was reported on potatoes in several localities in northern France in June and at Versailles on the 17th of that month. The outbreak was severe in the north. The fungus was also found at Versailles on tomatoes on 27th July and on eggplants on 25th August, by which time the disease had become extremely severe in the tomato plots, not one of the 22 varieties grown being resistant. Other species of *Solanum* affected in this locality included *S. caldasii*, *S. commersonii*, and *S. laciniatum*, the last-named being very severely attacked. *S. demissum* remained unaffected [cf. ibid, xi, p. 672].

Gibberella saubinetii was frequently noted on the débris of the previous years' hop vines; the young shoots from the same hills, however, remained perfectly healthy.

A detailed note is given on the situation as regards vine mildew (*Plasmopara viticola*) during the period under review, while shorter notes deal with diseases of trees, flowers, &c. Very numerous bibliographical references are given.

Rapports sommaires sur les travaux accomplis dans les laboratoires en 1931. [Summary reports on the work done in laboratories during 1931.]—*Ann. des Épiphyties*, xviii, 1, pp. 54–96, 1932.

Further investigations at Russ (Bas-Rhin) into wart disease of potatoes (*Synchytrium endobioticum*) showed that degeneration, whatever its nature, has no influence on the behaviour of potatoes towards the fungus. No evidence was obtained to show that seedlings from susceptible plants were immune while, on the other hand, several resistant varieties gave susceptible seedlings.

Ascochyta rabiei [*R.A.M.*, xi, p. 344] was ascertained to be strictly specific to chick pea (*Cicer arietinum*).

In further investigations into the different forms of die-back of

apricots present in the Rhone valley [ibid., xi, p. 791] made principally to ascertain the part played by the fungi most frequently found in the necrosed areas of the wood, artificial inoculations were carried out on apricots, almonds, peaches, and myrobolan and St. Julien plums, positive results being obtained on the first two hosts with a strain of *Verticillium dahliae* isolated from apricot. On almond the die-back was particularly rapid and the percentage of infection very high, while on apricot it progressed more slowly.

In 1931, immediately on the first appearance of potato blight (*Phytophthora infestans*) in the vicinity of Bordeaux about 15th July, the local forecasting station recommended growers to spray the plants with Bordeaux mixture. This application, effected during the second half of July or early in August, was highly efficacious, the half of one experimental field sprayed on 20th July being almost free from the disease on 15th September, when the untreated half was very severely infected.

Phytopathologie. [Phytopathology.]—*Rapport sur le fonctionnement de l'Inst. des Recherches Agron. pendant l'année 1931*, pp. 342–370, 1932.

Most of the numerous items of interest in this account of plant disease work in State-aided institutions in France in 1931 have already been noticed from other sources [see preceding abstracts, and also *R.A.M.*, x, p. 495; xi, pp. 344, 503, 550, 566, 735, 801, 807].

Narasimhan (M. J.). **Report of work done in the Mycological Section during 1930–31.**—*Admin. Rept. Agric. Dept. Mysore for the year 1930–31*, pp. 24–27, 1932.

In 1930–31 spraying for the control of areca [*Areca catechu*] koleroga [*Phytophthora arecae*: *R.A.M.*, xi, p. 509] was carried out over an area of 4,900 acres in Mysore, at a cost (for materials) of Rs. 16,900 [about £1,267].

Single spore cultures of the *Phytophthora* previously reported [ibid., x, p. 81] as isolated from jack [*Artocarpus integrifolia*] all developed oospores; the species thus appears to be homothallic.

'Anabe roga' disease of coco-nuts [*Ganoderma lucidum*: ibid., viii, p. 563], frequently confused with bleeding disease [*Thielaviopsis paradoxa*], is much more serious than the latter, and sooner or later kills the tree. In the early stages the lower green leaves droop, the crown narrows, and sometimes the foliage turns yellow.

Definite evidence was obtained that the organism causing black rot of coffee [*Corticium koleroga*: ibid., x, p. 239] at a certain stage in its life-history permeates the leaf tissue; bamboo in the surrounding jungle was also severely infected by this fungus.

In November 1930 potato fields in a locality where the Rickets variety is that most commonly cultivated were badly attacked by *Alternaria* [*solani*], considerable loss being sustained by the grower.

PARK (M.). **Report on the work of the Mycological Division.**—*Ceylon Administration Reports, Report of the Director of Agric. for 1931*, pp. D103–D111, 1932.

Heavy monsoon rains in Ceylon in 1931 favoured the spread of *Phytophthora palmivora* on *Hevea* rubber [*R.A.M.*, xi, p. 401]; most damage occurred in bud-wood nurseries and young clearings of budded rubber. Some estates reported a die-back of young *Hevea* shoots caused by the same fungus, a similar die-back being associated with *Gloeosporium albo-rubrum*, inoculations of artificially wounded shoots with which occasionally reproduced the condition.

Coco-nut palms growing in humid conditions were killed by bud rot due to *P. palmivora* [ibid., x, p. 594], this fungus being also found (for the first time in Ceylon) on *Carica papaya*, causing rotting of the fruits, stem, and collar.

Bacterial wilt (*Bacterium solanacearum*) attacked chillies [*Capsicum annum*: ibid., xi, p. 123], tomatoes, and potatoes; the first-named host also developing a disease referred to as 'little leaf' [cf. ibid., ix, p. 10].

Owing to the prompt eradication now general in Ceylon, bunchy top of plantains [ibid., x, p. 472] is causing less damage than formerly. Panama disease (*Fusarium cubense*) [*F. oxysporum cubense*] was recorded on plantains for the first time, the organism being isolated. There appeared to be marked differences in susceptibility amongst the varieties grown. Other diseases of plantains recorded included leaf spot (*Cercospora musae*), and a pseudostem infection associated with a *Fusarium*.

Mangoes were attacked by *Corticium salmonicolor* and by leaf diseases due to *Pestalozzia mangiferae* and *Cephaleuros parasiticus*. *Melanconium fructicolum* was found on pomegranate fruits and *Glomerella cingulata* on apples.

Ginger left too long in the ground was attacked by *Rhizoctonia* [*Corticium*] *solani*, the fungus injuring the leaves and rhizomes [cf. ibid., vii, p. 305].

A small experimental plot of Barbados 208 sugar-cane was attacked by sereh disease, the diagnosis being made by Dr. O. Postumus of Java.

Regular spraying with lime-sulphur markedly reduced citrus canker (*Pseudomonas citri*) [ibid., x, p. 786]. Mandarin types of orange are highly resistant, lemon less so, and most of the other citrus fruits grown are susceptible. Several instances of citrus gummosis were observed, two fatal attacks on grapefruit trees being attributed to a *Diplodia* closely resembling *D. natalensis*. A *Phytophthora*, probably *P. palmivora*, was recorded for the first time as causing, during wet weather, a die-back of young Washington Navel orange shoots; the pathogenicity of the organism was confirmed by inoculation.

Other new records [cf. ibid., xi, p. 223] included *Bacillus carotovorus* on carrot, *Fomes lucidus* [*Ganoderma lucidum*] on the roots of *Duranta plumieri* and *Gliricidia maculata*, *Helminthosporium* sp. and *Piricularia oryzae* on *Eleusine coracana*, *Peronospora* (?) *parasitica* on *Hibiscus esculentus*, *Sphaerostilbe repens* on the roots of *Poinciana regia*, and *Vermicularia zingiberae* [*Colletotrichum zingiberis*: ibid., xi, p. 545] on ginger.

Forty-third Annual Report of the Indiana Agricultural Experiment Station for the year ending June 30, 1930.—116 pp., 41 figs., 1 graph, 1930. [Received November, 1932.]

The following items of phytopathological interest occur in this report. Out of 734 wheat varieties from all parts of the world inoculated in the greenhouse with two physiologic forms of leaf [brown] rust [*Puccinia triticina*], 53 were found to show resistance. Out of a total of 135 selections resistant to the two physiologic forms 3 and 5, 48 showed resistance also to form 9 [*R.A.M.*, x, p. 363]. Selections of 69 wheat species and varieties were inoculated with four forms of brown rust, to all of which Warden, Vernal Emmer, Acme, and Buford proved resistant. Thirty-eight varieties and selections of spring and 167 of winter wheats were exposed to infection in field plots in various parts of Indiana and elsewhere, 15 of which gave marked evidence of resistance to *P. triticina*. In a three-rod row test of 179 rust-resistant selections, 39 gave yields above the control (37 bushels), while in an experiment with 72 resistant selections in twelve-rod rows, 14 showed an increase over the check. Among 44 collections of brown rust from nine States, physiologic forms 3, 5, 6, 9, 10 [ibid., v, p. 477], and four as yet undescribed were the most common. The varietal resistance of Webster to forms 3 and 5 was found to be inherited as a simple dominant factor. In the third generation of interspecific crosses the resistance of emmer wheat and of rye was shown to have been transferred to bread wheat types.

Of 25 Australian barley varieties inoculated with leaf [brown] rust [*P. anomala*: ibid., x, p. 230] two showed resistance to two physiologic forms common in the United States. In crosses between the two resistant and other varieties, resistance was found to be probably due to one main factor, usually dominant.

Sixteen out of 20 local rye selections also proved resistant to leaf [brown] rust [*P. secalina*], together with 3 out of 120 from Wisconsin, Minnesota, and Saskatchewan.

Bacterial wilt of maize [*Aplanobacter stewarti*: ibid., xi, p. 560] was extremely severe in the sweet corn trial plots at Lafayette in 1929, but some new hybrid strains of Golden Bantam, as well as Evergreen and Country Gentleman, showed a high degree of resistance to the parasite, which produced an average of 11 per cent. sterility in the best commercial strains of the first-named variety.

Out of 970 wheat varieties studied for their reaction to powdery mildew (*Erysiphe graminis*) [ibid., x, p. 718], 79 were highly resistant. The same was true of 39 out of 415 barley varieties, Arlington 110, Hanna 153, and Goldfoil 172 giving particularly satisfactory results. Five physiologic forms of powdery mildew have been differentiated on barley [ibid., x, p. 176]. In most of the crosses between resistant and susceptible barleys, resistance is inherited as a simple dominant factor. Nine of the 120 rye varieties and selections gave evidence of a high degree of resistance to powdery mildew.

Certain clover selections have shown resistance to *E. polygoni*, while others have been found resistant to anthracnose [*Kabatiella caulivora*: ibid., xii, p. 11].

Viruses have been collected from healthy potatoes and Jimson weed [*Datura stramonium*] which will combine with the tomato mosaic virus to produce streak [ibid., xi, p. 808]. When present alone in tomato, these viruses produce symptoms ranging from a very mild to a strongly marked mottling with necrotic spotting and burning. The potato virus constituent of the streak virus complex may be recovered by the inoculation of *D. stramonium*, seedling potatoes, or a variety of eggplant, in which tomato mosaic does not become systemic. Certain of the potato viruses withstood drying in diseased tissue for at least 16 days, and ageing in juice of diseased tomato and *D. stramonium* for two months. Apparently only one potato virus will combine with tomato mosaic to produce streak. One of the viruses found in all apparently healthy standard American potato varieties, but not in true seedlings unless by inoculation, produces necrosis in some seedlings, mottling in others, and no symptoms in a third group.

The Queen of the Market aster selections made in 1927 maintained their resistance to wilt [*Fusarium conglutinans* var. *callistephi*: ibid., xi, pp. 330, 746], while promising results were also given by a recent selection of Ostrich Feather.

Report of the California Agricultural Experiment Station from July 1, 1930, to June 30, 1931.—118 pp., 3 figs., 1932.

This report contains, in addition to items already noticed from other sources, the following references of phytopathological interest [cf. *R.A.M.*, xi, p. 161]. The identity of the organism responsible for the 'diamond canker' of French prunes [ibid., ix, p. 766] has not yet been established. Infection usually originates in wounds in the bark of the trees, which develop an abnormal thickening of the corky tissues; ultimately the whole cortex dies and the tree becomes stunted.

Septoria rubi has been found to attack the canes of the Cory Thornless blackberry [ibid., xi, p. 61] so severely as to render them unfruitful.

A species of *Dothiorella* growing in dead avocado twigs and leaf areas attacks the fruit as it softens in storage, causing superficial decay. A species of the same genus was further responsible for gummosis of *Cocos plumosa* trunks in Orange County; this host was also affected by a pinching of the crowns due to *Phomopsis* sp. The dull, black spots on the midribs and pinnae of *C. australis* leaves in San Diego County yielded a *Rosellinia*-like Ascomycete. *Fusarium* sp. was isolated from the dying leaf bases of *Phoenix reclinata*, from the blackened young central leaves of *Kentia*, and from streaks on the midribs of *P. canariensis*.

A study has been made of the effects on the proteoclastic enzymes of *Fusarium lycopersici*, of the root extracts of two strains of tomato, one resistant and the other susceptible to the wilt. Using liquefaction of gelatine and the production of amino acids from gelatine and 'bacto' beef as criteria, it was found that the extract from the resistant variety permitted more extensive liquefaction and a greater degree of protein hydrolysis.

Narcissus leaves are liable to attack by *Stagonospora curtisii* [ibid., xi, p. 786], the pathogenicity of which to *Hippeastrum* has

also been demonstrated. The fruit bodies of this organism in culture show the characters of *Phyllosticta*, a species of which is responsible for a red leaf spot of *Hippeastrum*. Studies on the relationship between these fungi are in progress.

STEYAERT (R. L.). **Rapport d'inspection phytopathologique des cultures de la Régie des Plantations de la Colonie (Rayon de Stanleyville).** [Report of the phytopathological crop inspection of the Administration of Plantations of the Colony (district of Stanleyville).]—*Bull. Agric. Congo Belge*, xxiii, 1, pp. 105–126, 14 figs., 1932.

Oil palms (*Elaeis guineensis*) in the Barumbu district are stated to suffer mainly from the trunk disease due to *Ganoderma applanatum* [*R.A.M.*, ix, p. 305], which has now been found to attack young as well as old trees. The examination of a young infected trunk failed to reveal the presence of the cavity usually regarded as typical of the disease, suggesting that this feature may be a consequence of secondary saprophytic invasion. The exodermis of the roots of infected palms was found to be friable, crumbling under pressure of the finger, and the vascular tissues were extensively penetrated by hyphae about 2 μ in thickness, while the medulla had disappeared. Rhizomorphs were absent, but fruiting sporophores protruded bracket-wise from the trunk. Before the removal of the sporophores they should be painted with carbolineum on the lower side in order to prevent spore dissemination during the process of detachment. The eradication and burning of diseased trees should be carried out with great care.

Cacao roots in the Likakula plantation were attacked by *Rigidoporus* (*Fomes*) *microporus* [*F. lignosus*: ibid., x, p. 80]. A branch canker, mainly involving the phloem tissues, is tentatively attributed to secondary fungous invasion following the insect *Sahlbergella singularis*. A white mycelium, 2 μ in thickness, was observed in the wood vessels, while a brown one, 4 μ in diameter, occupied the pith and medullary rays; the latter agrees with *Diplodia* [*Botryodiplodia*] *theobromae* [ibid., xi, pp. 26, 701], here acting evidently as a wound parasite. Three types of thread blight were distinguished on the aerial portions of cacao plants, viz., a *Corticium* type and two *Marasmioid* types (one with and the other without 'anker cells') [ibid., iv, p. 67], a key to the recognition of which is given. An unidentified species of *Colletotrichum*, characterized by uni- or biseptate setae, 117 to 234 μ long, slightly swollen at the base or in the middle, and cylindrical conidia, 22·5 to 35 by 5 to 8·75 μ, caused the development on cacao pods of sunken, dark brown spots bearing the pink acervuli of the fungus.

Hevea rubber in Yangambi was attacked by *F. lignosus* [ibid., xii, p. 54], while the partial cessation of the latex flow in one tree was found to be a result of brown bast [ibid., x, p. 620].

F. lignosus is the most dangerous parasite of coffee in the Lula plantations [ibid., ix, p. 177]. *Coffea klainii*, which is grown in a separate plot at the edge of the forest, was affected by a disease characterized by the presence on the roots of dendroid, spongy tumours, ranging from the size of a small nut to that of an egg

[see below, p. 91]. Sections through the tumours showed that they consisted of several layers, the outermost being composed of flat, yellowish cells measuring about 20 by 10 by 16 μ, the second of larger, elongated elements, and the innermost of more spherical cells, about 40 to 108 by 28 to 60 μ, containing masses of pale yellowish-brown granules. On staining a crushed preparation of the granular material with Ziehl-Neelsen's reagent, bacteriform bodies were detected, slightly tinged with blue, measuring 2·18 to 4·35 by 0·87 to 1·16 μ. Affected trees lost their leaves or appeared to be suffering from drought. The disease, which has also been observed on *C. robusta*, is of sufficient importance to warrant further investigations.

BRYAN (MARY K.). **Color variations in bacterial plant pathogens.** —*Phytopath.*, xxii, 9, pp. 787–788, 1932.

Similar white variants to that of *Aplanobacter michiganense* described in 1930 [*R.A.M.*, x, p. 415] have been observed in old beef agar cultures of *Bacterium campestre* [*Pseudomonas campestris*], *Bact. vesicatorium* [ibid., xi, pp. 803, 804], and *Bact. cucurbitae* [ibid., x, p. 639]. In *Bact. vesicatorium* the white strain was also isolated directly from typically spotted fruit from Mexico. Inoculation tests showed that the white variants of *Bact. vesicatorium* and *P. campestris* were as virulent as the normal yellow strains, which was not the case, however, with *Bact. cucurbitae*. In all three strains the white character persists in various culture media, reversion to yellow having occurred only in an occasional culture kept in a refrigerator for months. *A. michiganense* also produces a pink strain.

SCHÄTZEL (K.). **Beiträge zur Morphologie und Physiologie des bakteriellen Pflanzenkrebserregers.** [Contributions to the morphology and physiology of the bacterial plant cancer organism.]—*Phytopath. Zeitschr.*, v, 3, pp. 251–273, 1932.

No evidence was obtained in the author's studies on the morphology and physiology of *Pseudomonas* [*Bacterium*] *tumefaciens* that the 'rosette' or 'star' phase of the life-cycle represents a sexual process as suggested by various writers [*R.A.M.*, xi, p. 357]. It appears usually in the skin formed on the surface in liquid media and is, perhaps, concerned in the aeration of the latter. No proof was forthcoming, moreover, of the presence of filterable, ultramicroscopic gonidia as observed by Lieske [ibid., vii, p. 705]. The filters used were of porcelain, kieselguhr (Berkefeld N), and asbestos (Seitz E.K.), the last of which allowed the unaltered bacteria to pass in some of the tests. Filtration through membrane filters of pore size of 1 μ or less was also unsuccessful. Successful inoculation experiments on *Helianthus annuus* and *Nerium oleander* indicated that the strains under study were normal virulent strains. Tumour formation was further induced in *Euphorbia helioscopia*, but as no latex tubes were involved it was impossible to verify Lieske's hypothesis regarding the dissemination of infection within this plant by means of the latex.

RIVERA (V.). **Secondo contributo alla conoscenza della influenza dell'energia raggiante ambientale sull'accrescimento di piante terrestri e di neoplasmi vegetali.** [A second contribution to the knowledge of the influence of ambiental radiating energy on the growth of terrestrial plants and plant neoplasms.]—Reprinted from *Riv. di Biol.*, xiii, 1–6, 87 pp., 12 figs., 1931.

Continuing his earlier investigations [*R.A.M.*, x, p. 709], with special reference to the influence of ambient radiation, the author conducted an extensive series of experiments [which are fully described and the results of which are discussed in detail] in which *Pelargonium* plants inoculated with *Bacterium tumefaciens* were placed for periods ranging from 8 to 38 days in various types of containers differing in their resistance to the penetrating (especially the cosmic) rays of the atmosphere.

Plants kept in containers made of one thickness of lead developed large neoplasms, usually bearing aerial roots; the whole plant, or the shoot bearing the tumour, if mature plants were used, wilted. Further inoculations of etiolated tissues on these plants gave negative results, or produced very small, ill-developed neoplasms.

Plants kept in wooden containers showed a very slow neoplastic growth and never wilted, any wilt, even of the shoot bearing the tumour, if it did occur, taking place only after a long time. Further inoculations of the etiolated tissues gave rise to well-defined neoplasms.

Plants kept in lead boxes lined with paper or in double-walled lead containers rapidly developed large neoplasms, sometimes with aerial roots, but continued to live for a longer or a shorter period. Inoculations of etiolated tissues gave fairly well-developed neoplasms.

The author concludes that the containers made of one thickness of lead induced a considerable acceleration in the growth of the normal shoots and also excited to the highest degree the formation of neoplastic tissue. In the wooden containers the disease developed very slowly, and the plant appeared to be unharmed by the presence of the tumour. The remaining types of container, which included lead lined with paper or glass and wood lined with glass, gave results intermediate between these two. Ultra-penetrating radiation is considered to retard cellular multiplication.

RIVERA (V.). **Radiazione ambiente ed accrescimento nei vegetali.** [Ambiental radiation in relation to plant growth.]—Reprinted from *Riv. di Biol.*, xiii, 1–6, 40 pp., 1931.

After summarizing and discussing the results obtained in his earlier investigations into the effect of radiation upon normal and abnormal plant tissues [cf. *R.A.M.*, ix, p. 25 and preceding abstract] the author describes an experiment in which a geranium plant bearing a tumour resulting from an artificial inoculation with *Bacterium tumefaciens* effected on 16th March, 1929, was, on 6th July, freshly inoculated with the same organism at the tip of the branch carrying the tumour and a few moments later exposed to the long Hertzian waves below the infra-red, the wave-length used being 2 m. at 40 watts oscillation. The plant was **exposed**

for about 100 hours, spread over 12 days, each twelve hours of exposure being followed by at least twelve hours' rest. The oscillation used produced an electro-magnetic wave of about 12·3 m., and the inoculated branch was placed at a distance of about 10 cm. away. A control plant, exactly similar, and inoculated in exactly the same manner on the same dates, remained 10 or 12 m. away, separated from the apparatus by two walls.

Four days after exposure was begun the branch bearing the old tumour, as well as the old tumour itself, ceased to grow, while the new tumour continued to make marked growth. The new neoplasm developing on the control plant grew more slowly. The inoculated shoot and the neoplasms then gradually died, while the control plant remained green and produced a very large tumour which was still alive on 15th February, 1930.

The author considers that the stimulation to the growth of the tumour given by the exposure was directly responsible for the death of the shoot, the increased need for food material on the part of the tumour rapidly exhausting and finally killing the branch.

Thomas (J. A.). **Contribution à l'étude des réactions de quelques invertébrés à l'inoculation de substances à propriétés cancérigènes et du Bacterium tumefaciens.** [A contribution to the study of the reactions of some invertebrates to inoculation with substances of cancer-inducing properties and with *Bacterium tumefaciens*.]—*Ann. Inst. Pasteur*, xlix, 2, pp. 234–274, 16 figs., 1932.

This is a considerably expanded account of the writer's investigations on the reactions of various invertebrates to inoculation with *Bacterium tumefaciens* [*R.A.M.*, xi, p. 227], the following additional information on which may be mentioned. The inoculation of cancer-inducing substances, such as arsenate of soda, indol, or coal-tar into *Ascidia mentula* and *Nereis diversicolor* provoked only slight inflammatory reaction in contrast to the fatal results induced by *Bact. tumefaciens*. Another Gephyrean, *Phascolosoma vulgare*, reacted similarly to *Sipunculus nudus* [loc. cit.] on inoculation with the bacterium, which developed well in culture in the blood of this worm kept under sterile conditions *in vitro*.

Sanford (G. B.) & Broadfoot (W. C.). **Epidemiology of stripe rust in Western Canada.**—*Scient. Agric.*, xiii, 2, pp. 77–96, 3 maps, 1 graph, 1932. [French summary, p. 131.]

This paper gives an outline, based on four years' observations, of the prevalence, distribution, and host range of stripe [yellow] rust (*Puccinia glumarum*) of wheat in Canada, with particular reference to Alberta [cf. *R.A.M.*, viii, p. 492]. Each year the rust appeared first (in July) in the south of this province, usually on *Hordeum jubatum* in low-lying places, whence during late August it gained the uplands and spread to central Alberta towards the middle of September, the general trend of dispersion being northwards. There was distinct evidence that the yellow rust rarely persists through the winter in the uredo stage in Canada. Only two cases of its overwintering in this stage on autumn-sown wheat were observed; in one case it failed to become established on the

new foliage, and in the other, although some of the new leaves were slightly attacked in the spring, the rust soon disappeared as these leaves died. There was no evidence of its persistence from season to season in the form of dormant mycelium.

The investigation suggested that the annual reappearance of yellow rust in Alberta is due to wind-borne spores coming during June or early July from the States of Washington, Idaho, and possibly Montana, but not from southern British Columbia. It is believed that the late and slow development of the rust in central Alberta may be explained chiefly by the action of adverse winds which hinder the spread of the infection from the south, and that in certain parts of the province the check to the development of the rust is caused by deficient rainfall rather than by differences in temperature during August and September.

The scarcity of the yellow rust in central Saskatchewan may find a better explanation in the lack of sufficient inoculum coming from Alberta at the critical time for infection, than on the basis of temperature or of lack of susceptible hosts.

Becker (K. S.). **Die amtlich empfohlenen Beizmittel nach dem Stande vom Herbst 1932.** [The status of the officially recommended disinfectants in the autumn of 1932.]—*Deutsche Landw. Presse*, lix, 39, p. 491, 1932.

A table is given showing the various fungicides officially recommended by the German Plant Protection Service for the control of seed-borne cereal diseases, together with the appropriate rates of application and duration of treatment. Ceresan is the only dust recognized as effective against the four principal diseases of this nature, viz., wheat bunt [*Tilletia caries* and *T. foetens*], snow mould of rye [*Calonectria graminicola*], barley stripe [*Helminthosporium gramineum*], and loose smut of oats [*Ustilago avenae*] at the rate of 200, 200, 300, and 500 gm. per doppelzentner of seed-grain, respectively. Liquid treatments effective against all four diseases are ceresan liquid U. 564 (30 minutes' immersion at 0·1 per cent. for wheat, rye, and barley, 0·2 per cent. for oats), germisan (15 minutes at 0·125 per cent. for wheat, 30 minutes at 0·125 per cent. for rye, one hour at 0·125 per cent. for barley, and 30 minutes at 0·25 per cent. for oats), and uspulun-universal (30 minutes at 0·2 per cent. for wheat and rye, one hour at 0·25 per cent. for barley and oats). Ceresan U. 564 and germisan may also be applied by the short disinfection process [*R.A.M.*, xi, p. 502] at the following rates: ceresan, 3 l. at 2, 1·75, and 2·5 per cent., respectively, for wheat, rye, and barley, and 4 l. at 3·5 per cent. for oats; germisan, 4 l. at 1 or 3 l. at 2 per cent. for wheat, 3 l. at 1·75 per cent. for rye, 3 l. at 2·5 per cent. for barley, and 4 l. at 3·5 per cent. for oats.

Briggs (F. N.). **Inheritance of resistance to bunt, Tilletia tritici, in hybrids of White Federation and Odessa Wheat.**—*Journ. Agric. Res.*, xlv, 8, pp. 501–505, 1 graph, 1932.

The result of further experiments [conducted on the same lines as the previous work: *R.A.M.*, xi, p. 500] on the inheritance in wheat of resistance to bunt (*Tilletia tritici*) [*T. caries*], in which the F_2 and F_3 generations of crosses between the susceptible White

Federation and the resistant Odessa were tested for resistance, showed that Odessa differs from White Federation in one dominant factor for resistance. It was also shown that this factor, as well as the factor for resistance in White Odessa [ibid., ix, p. 515], is identical with the factor in Martin [loc. cit.]. The constitution of these two wheats, like Martin and Banner Berkeley, may be designated MMhh. The proper designation for Turkey 1558 and Turkey 3055 [ibid., xi, p. 500] has not yet been determined, but they each contain a single factor for resistance which is similar in effect to the second Hussar factor HH.

Churchward (J. G.). **Inheritance of resistance to bunt, Tilletia tritici (Bjerk.) Winter, and other characters in certain crosses of 'Florence' Wheat.**—*Proc. Linn. Soc. New South Wales*, lvii, 3–4, pp. 133–147, 4 graphs, 1932.

The results of further work in New South Wales on the genetics of resistance in wheat to bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, xi, p. 99] showed that in the F_3 generation of all the crosses between the resistant Florence and four susceptible commercial Australian varieties, namely, Firbank, Gullen, Yandilla King, and Marshall's No. 3, the three classes, homozygous susceptible, heterozygous susceptible, and homozygous resistant, gave an approximation to a ratio of 1 : 2 : 1, and indicated the presence of a single factor difference with dominance of susceptibility, as in the Florence × Hard Federation cross [loc. cit.]. In the Florence × Gullen cross there was evidence that inheritance of resistance to bunt is independent of the inheritance of colour of chaff.

Mannozzi Torini (L.). **Influence des produits d'excrétion des champignons du sol sur le développement du Blé.** [The influence of the products of excretion of soil-inhabiting fungi upon the growth of Wheat.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, iv, 9, pp. 244–248, 1932.

Some 40 species of soil-inhabiting fungi obtained from various types of agricultural lands (a few being strong facultative parasites, but most of them common saprophytes) were grown on carrot broth for one and a half months at laboratory temperature. The culture liquid in which each fungus had been grown was filtered off aseptically, 20 c.c. of the filtrate being placed in a Petri dish 15 cm. in diameter and containing three sterilized paper filter discs. Ten carefully chosen wheat seeds sterilized with uspulun (2·5 per 1,000) and rinsed in sterilized water were then placed in each dish. Two Petri dishes containing sterilized carrot broth and two containing sterilized water were used for control purposes. On the twentieth day after germination the length of the roots and aerial part of the seedlings was measured.

The fungi tested, as regards the effects of their products of excretion, fell into three groups. There were 25 species whose excretions reduced the length of the roots and the aerial parts. They included four species of *Trichoderma*, *Aspergillus niger*, *Cunninghamella* sp., *Rhizoctonia* sp., *Cephalosporium* sp., *Rhizopus nigricans* [*R.A.M.*, xi, p. 389], and *Botrytis cinerea*. A further 10 species reduced the length of the roots, but had no apparent deleterious effect on the aerial parts. The products of

the remainder appeared to exercise no appreciable effect at all; these comprised *Mucor* sp., *Mortierella* sp., *Fusarium* sp., *Cephalosporium* sp., and *Absidia spinosa*.

The culture liquids from the first group, and to a less extent those from the second, produced various pathological changes in the roots which, in the case of the more toxic species, were not only rapidly killed, but underwent partial or complete dissociation of the tissues.

Further experiments demonstrated that the soil absorbs completely (so that filtration through soil removes them) or in part the excretory products released by soil-inhabiting fungi. Some of the harmful products thus absorbed injure seedlings sown in the soil and are evidently in a form accessible to the roots; others cause no injury and hence, though present, are evidently not in a form that can be taken up by the plant.

COTTER (R. U.). **A new form of Oat stem rust from a Barberry area.**—*Phytopath.*, xxii, 9, pp. 788–789, 1932.

A new physiologic form, designated form 10 [cf. *R.A.M.*, iii, p. 22; xi, pp. 362, 437], of oat stem rust (*Puccinia graminis avenae*) was identified in two collections from a barberry area in Wisconsin, in 1930. Both collections have been cultured in the greenhouse for over eight months and have behaved consistently on the differential oat varieties. Form 10 attacks Richland (C.I. 787), which is resistant to 1, 3, 7, 2, and 5, the most prevalent forms of oat stem rust in the United States. While forms 4 and 6 also infect Richland heavily, White Tartar (C.I. 551) is very susceptible to these, but resistant to 10, and Joanette Strain (C.I. 2660), resistant to 4 and susceptible to 6, reacts indeterminately to form 10, the infection type (X) [ibid., ii, p. 159] being similar to that induced on this variety by form 5. It is suggested that the new form originated by hybridization on the barberry.

RADEMACHER (B.). **Praktische Möglichkeiten zur Verhütung und Bekämpfung der Urbarmachungskrankheit.** [Practical possibilities for the prevention and control of the reclamation disease.]—*Fortschr. der Landw.*, vii, 18, pp. 457–460, 3 figs., 1932.

Continuing his investigations on the reclamation disease of cereals in Schleswig-Holstein [*R.A.M.*, x, p. 489], the writer draws attention to the prevalence of illness among livestock pastured on the affected areas.

A number of figures are given showing the beneficial effects of copper sulphate and other copper-containing preparations on the yield of crops suffering from the disease [ibid., xi, p. 768].

It was shown by a pot test on Lochow's yellow oats that the remedial effects of copper sulphate and nitrate are greatly increased by direct application to the foliage instead of through the soil (17 and 17·55 gm. of seed-grain, average from two pots, for copper sulphate and copper nitrate, respectively, for the former compared with 6·85 and 5·35 gm. for the latter method).

A study of the varietal reaction of oats to the disease showed that most of the standard sorts are liable to more or less severe

injury, among them several of the Swedish Svalöfs, and a number of other well-known varieties [which are listed]; the Rotenburger Black, Black President (Dutch), and Black Mesdag (U.S.A.), however, are resistant (also to grey speck) and should be more widely cultivated. A comparative test in 1931 indicated that better results may be expected on affected soils from a resistant, relatively low yielding variety (Black President) without treatment than from a prolific sort (Svalöf's Victory) receiving copper sulphate (156 kg. per hect.). The yield of the treated plot of the latter was 672·8 kg. per hect. compared with 94·4 kg. for the control, the corresponding figures for Black President being 1846·2 and 1453·9 kg. per hect. Hanna barleys are highly susceptible, while Pflug's Intensiv and Extensiv are fairly resistant.

Cotter (R. U.) & Levine (M. N.). **Physiologic specialization in Puccinia graminis secalis.**—*Journ. Agric. Res.*, xlv, 5, pp. 297–315, 1 fig., 1 map, 2 graphs, 1932.

This is a summarized account of the results obtained in the study from 1921 to 1931 of 147 collections of rye stem [black] rust (*Puccinia graminis secalis*) [*R.A.M.*, x, p. 365], mainly from the rye-growing districts of the United States, on five differential varieties of rye [a brief botanical description of which is given]. Fourteen different physiological forms of the rust were determined, the geographical distribution, characteristic reaction on the differential hosts, and pathogenicity of which are indicated in tables. Attention is called to the special technique which has been necessary for the identification of the forms, owing to the fact that rye is cross-pollinated, but apparently the results are no less certain than in the case of the rusts of wheat or oats.

Form 11 was isolated from the largest number of localities, and was markedly predominant in the epidemics of 1926, 1927, 1929, and 1931. Form 7 was collected almost as often as the former; it appeared to be scattered over a greater geographical area, but did not occur in as many years though it was especially common in 1927. The remaining forms were only collected occasionally. Collections of forms 2 and 4 were also received from France, and form 11 from Scotland.

The frequency of the occurrence of the physiological forms was not always co-extensive with their distribution, nor was the prevalence of a given form paralleled by its virulence on the differential hosts. The pathogenicity of the forms was but slightly and only temporarily affected by environmental conditions, e.g., temperature and light. There was strong circumstantial evidence of the occurrence of colour mutations, but none of mutations in parasitic behaviour. The fact that new forms of wheat black rust (*P. graminis tritici*) were produced by crossing it with *P. g. secalis* is considered to support the possibility of the origin in nature of new forms of black rust on rye through hybridization.

Dixon (S.). **The relation of food to disease.**—*Journ. Soc. Chem. Ind.*, li, 39, pp. 787–795; 40, pp. 808–813, 1 diag., 1932.

In connexion with a survey of the history and etiology of various forms of food poisoning, the writer gives a brief account

of ergotism due to the consumption of bread made from rye infected by *Claviceps purpurea* [*R.A.M.*, xi, p. 445]. Recent work by E. Mellanby indicates that lack of vitamin A, together with the presence of some constituent of ergot other than ergotoxin, is responsible for the convulsive form of the disease, while ergotoxin causes gangrene. It is estimated that in the Russian outbreak of 1926 [ibid., viii, p. 304] at least 11,000 persons were affected (some fatally), chiefly by nervous symptoms. The proportion of ergot in the rye ranged from 1 to 26·7 per cent. by weight in different districts, the disease occurring when 1 per cent. was present and proving fatal with 7 per cent. As a result of this epidemic the U.S.S.R. fixed a limit of 0·15 per cent. for the amount of ergot regarded as permissible in flour, the corresponding allowance in Germany being 0·1 per cent. In the mild epidemic among Jewish immigrants in England following the wet summer of 1927 [ibid., vii, p. 505], the grain from which the rye meal was prepared yielded 0·9 per cent. of ergot by hand picking, while colorimetric analysis showed 1·5 per cent., equivalent to between 0·18 and 0·3 per cent. in the flour.

BAUCH (R.). **Über die genetischen Grundlagen von Zwittrigkeit und neutralem Verhalten bei Brandpilzen.** [On the genetic bases of hybridization and neutral behaviour in smut fungi.] —*Planta*, xvii, 3, pp. 612–640, 1932.

A comprehensive account is given of the writer's continued studies on the genetics of the smut fungi, from which it appears that, in *Ustilago longissima* [*R.A.M.*, xi, p. 569; xii, p. 17], both hybrid and 'neutral' or sterile strains (i.e., those giving no evidence of sexual reactions) occur among the progeny of spores of a known genetic constitution. The segregation of dioecious haplonts of these strains was found to depend on the distribution of the chromosomes bearing the factors responsible, respectively, for normal reproduction and 'neutrality'. The development of 'solopathogenic' strains of maize smut (*U. zeae*) [loc. cit. and next abstract] seems also to depend on similar chromosomal aberrations to those occurring in *U. longissima*.

BAUCH (R.). **Die Sexualität von Ustilago scorzonerae und Ustilago zeae.** [The sexuality of *Ustilago scorzonerae* and *Ustilago zeae*.]—*Phytopath. Zeitschr.*, v, 3, pp. 315–321, 4 figs., 1932.

The author applied the technique already found successful with *Ustilago longissima* and *Sphacelotheca schweinfurthiana* to induce sporidial fusion in *U. scorzonerae* (a destructive parasite of *Scorzonera humilis* in north Germany) and the maize smut (*U. zeae*) [see preceding abstract]. In the latter, as in *U. longissima*, exploratory hyphae and 'tangle fusions' [*R.A.M.*, xi, p. 569] were detected, and the fungus was found to have more than two types of sex, giving a typical picture of multipolar sexuality, while *U. scorzonerae* is bipolar. The best differentiation of the sexual behaviour of combinations of single-sporidial cultures were obtained with young (one-day-old) colonies at a temperature range of 20° to 30°C. Multipolar sexuality depends on the existence of two

groups of factors, one group consisting of sex factors in the narrow sense, a combination of any two of which permits of full sexual reaction, while the other consists of sterility factors, the combination of two identical factors of this group giving rise to exploratory hyphae and tangles which cannot infect the host or produce smut spores. Six sterility and two sexuality factors were found to be involved among one hundred isolations of monosporidial strains of *U. zeae*. A table is given showing the reactions of ten haplont types of maize smut.

RODENHISER (H. A.). **Heterothallism and hybridization in Sphacelotheca sorghi and S. cruenta.**—*Journ. Agric. Res.*, xlv, 5, pp. 287–296, 3 pl., 5 diags., 1932.

Heterothallism in *Sphacelotheca sorghi* [*R.A.M.*, xi, p. 448] and *S. cruenta* [ibid., xi, p. 235] is stated to have been established in the experiments reported in some detail in this paper, by the fact that inoculation of Reed kafir sorghum, which is susceptible to both species, with a monosporidial culture of either failed to produce infection, while infection resulted and smutted heads and spores were produced when the plants were inoculated with two monosporidial lines in certain combinations. So far only two opposite sex groups have been determined in the two species, which were shown by crossing to be interfertile; the sex groups remained constant both in the inter- and in intraspecific crosses. The factors determining sex in monosporidial lines of both species segregated on a 2 : 2 and a 1 : 3 basis, and appeared to be independent of those determining type of growth on artificial media [cf. ibid., xi, p. 446].

Intraspecific crosses produced sori in the host panicles that were macroscopically typical of the species, while in interspecific crosses the sori produced were predominantly characteristic of *S. cruenta*. Both the elongated and the spherical hyaline sterile cells, which are usually considered to be, respectively, typical of *S. sorghi* and *S. cruenta*, were present in both the intra- and the interspecific crosses, indicating that this feature has no taxonomic significance.

There was some evidence that the sexual compatibility of paired monosporidial lines may be detected soon after inoculation, as when the plants were inoculated with sexually compatible lines distinct chlorotic areas developed, while plants inoculated with monosporidial or sexually incompatible lines remained normal.

FAWCETT (H. S.). **New angles on treatment of bark diseases of Citrus.**—*California Citrograph*, xvii, 10, pp. 406–408, 1932.

In this paper the author gives a popular account of the conditions that favour the development of the principal bark diseases of citrus trees in California, namely, psorosis [*R.A.M.*, xi, pp. 367, 770], decorticosis (shell bark) of lemon trees (*Phomopsis californica*) [ibid., x, p. 98], and brown rot gummosis (*Phytophthora citrophthora*) [ibid., xi, p. 779], and also of the measures for their prevention and treatment.

Two types of psorosis seem to occur, a common one ('psorosis A') with roughening and scaling of the bark at an early stage, while gum production is scanty, and a second ('psorosis B') in which a quantity of gum oozes out while the bark is still alive and

shows no scaling. This last type spreads very rapidly on the stem and does not yield to early treatment as readily as psorosis **A.** The treatment by scraping and the application of a suitable fungicide to the scraped surface is still the best, and is equally effective against lemon decorticosis. The application of powdered Bordeaux mixture to the soil around the collar and main roots and painting the trunks with a thin Bordeaux wash are useful in preventing gummosis due to *P. citrophthora*.

REICHERT (I.) & PERLBERGER (J.). **Little leaf disease of Citrus trees and its causes. (Preliminary note.)**—Reprinted from *Hadar*, iv, 8, 6 pp., 1931. [Received October, 1932.]

In the summer of 1928 the little leaf disease of citrus [*R.A.M.*, x, p. 307] was severe in Palestine. The affected oranges showed abnormally heavy and premature flowering with malformation of the fruits. Buds from diseased trees produced diseased individuals in their turn.

No organism could be detected in the affected trees and attention was therefore directed towards other factors likely to be responsible. The rainfall in the Jaffa district during the winter of 1927–8 was only 418 mm., compared with 442 to 729 mm. during the previous eight years. The potassium content of the ash of abnormal leaves, moreover, was only 8·27 to 8·92 per cent. as against 11·58 to 12·80 per cent. for healthy ones. Potassium is known to increase the water-holding capacity both of the soil and of the plant. The sap concentration of leaves from diseased trees budded on sour orange (*Citrus bigaradia*) stocks was found to be 23·8 to 23·9 per cent., compared with 20·2 to 20·6 per cent. in normal ones, the corresponding figures for those on sweet lime (*C. limetta*) being 21·4 to 21·5 and 15·8 to 16 per cent., respectively. The xeromorphic nature of little leaf is thus considered to be established.

[SMITH (F. E. V.).] **Coconut disease in St. Mary.**—*Journ. Jamaica Agric. Soc.*, xxxvi, 9, pp. 448–452, 1932.

Two forms of bronze leaf wilt of coco-nut palms [*R.A.M.*, ix, p. 238] are now present in Jamaica, in one of which the circle of leaves round the bud (but not including the youngest central ones) turns yellow, then ashen-grey, and dies, many of the leaf stalks showing brown streaks and cracks from which gum oozes. In the other form, present in clay soils, the same part of the tree is affected, but the leaves turn dark brown or bronze. Both forms of the disease have a common origin, and though they are associated with secondary fungi, these are organisms that are present on coco-nut palms everywhere, and are not the cause of the trouble. The locality most recently affected in Jamaica has suffered from a series of droughts at exceptional times, and these have been followed during the last two years by two and a half times the normal rainfall; here the disease is confined almost entirely to the hill slopes where the soil is a heavy clay, and is, in the author's opinion, due to the heavy rainfall.

A very similar situation existed in the same districts in 1911 and 1912, when, however, it was less apparent as there were fewer

coco-nuts grown. Where the palms are growing in heavy soil bronze leaf is rife, but with proper cultivation and drainage it can be reduced to insignificance. The author considers that the forms of wilt under discussion affect only trees weakened by abnormal weather conditions and grown in unsuitable soil.

STEYAERT (R. L.). **Une épiphytie bactérienne des racines de Coffea robusta et C. klainii.** [A bacterial epiphyte of the roots of *Coffea robusta* and *C. klainii*.]—*Rev. Zool. Bot. Afr.*, xxii, 2, pp. 133–139, 2 pl., 1932.

An account is given of the tumours on the roots of coffee (*Coffea robusta* and *C. klainii*) in the Lula plantations, Stanleyville, Belgian Congo [see above, p. 81]. In general appearance the more or less spherical, light brown nodules resemble those found in other countries on alder [*R.A.M.*, x, p. 476], but the coffee tumours are paler and more fragile. The internal structure of the two types of nodule is also closely similar. The organism isolated from the coffee tumours, to which the name *Bacillus coffeicola* n. sp. is given, stains well with basic fuchsin. Like *B. radicicola* [ibid., xi, p. 592], the coffee pathogen contains one or more chromatic centres and is capable of assuming Y or T shapes, so that the two are evidently closely related. *B. coffeicola* is non-acid-resistant and non-flagellate.

MALLAMAIRE (A.). **Sur une maladie du Caféier à la Côte d'Ivoire.** [On a disease of Coffee on the Ivory Coast.]—*Agron. Colon.*, xxi, 174, pp. 193–197, 1932.

Five-year-old *Coffea liberica* trees and to a less extent the Gros Indénié variety in the Lower Ivory Coast became attacked in 1930, and to a progressively greater extent in the two succeeding years, by a severe form of apoplexy in which the bushes died before the leaves had time to turn yellow or fall. No lesions were present on the aerial parts, but the larger roots bore flattened, yellowish-white strands, the outer part of which consisted of yellow, septate hyphae, 3 to 4·5 μ in diameter, and with numerous clamp-connexions. Inside these were hyaline filaments of about the same diameter. The fungus is thought to be possibly *Fomes lignosus* [see above, p. 80].

Control consists in uprooting and burning the diseased trees, encircling affected areas with a trench, and adopting sanitary precautions such as liming the soil, improving drainage, and removing all fallen trees and stumps [cf. *R.A.M.*, xii, p. 54].

HEWISON (R.). **Blackarm in the Gezira, season 1931–32.**—*Empire Cotton Growing Review*, ix, 4, pp. 276–284, 1932.

This report embodies the author's observations on the incidence and development of the blackarm disease (*Bacterium malvacearum*) of cotton [*R.A.M.*, xi, p. 450] in the Gezira during the 1931–2 season, in the attempt to throw some light on the still obscure points in the life-history of the organism. The bulk of the seed used (which was sown at a later date than usual, namely, between 10th and 31st August) was freshly imported from Egypt and was disinfected with abavit B, with the result that no primary infection

of the cotyledons was observed in the seedlings. In the areas, however, that were sown before or at the time of the rains which occurred on 21st and 22nd August, the seedlings suffered heavily from secondary infection, while in the areas sown a few days later the plants showed little disease, and the September sowings in most cases escaped entirely. These observations do not support Massey's opinion that the fate of the cotton crop, as far as blackarm is concerned, is decided during the period of the germination of the seed [ibid., x, p. 661]. Serious secondary attack was practically confined to areas on which more than 100 mm. rain were recorded after sowing was commenced, and the damage done was most severe in the areas where the rainfalls were the heaviest.

The secondary infection, the first signs of which were detected about 18th September, chiefly came from land sown to cotton during the previous season, infection being usually heaviest on the side next to the latter. The rapid increase of the disease often observed is probably due, not so much to spread from the first infected plants, as to a progressive activation of the causal bacterium, which is distributed in an inactive condition over the whole area long before any signs of the disease are observable. During the 1931–2 season the inactive bacterium was presumably all the time in contact with or near the cotton seedlings, and was roused to activity by the heavy rainstorms that occurred on the 21st and 22nd August; this is supported by recent work by Archibald, who showed that blackarm can be induced in a healthy cotton plant by scattering dry dust containing infective material upon the leaves and keeping the latter sufficiently moist, and who also recovered the organism from dust washed from leaves collected in the field from apparently healthy plants. While volunteer cotton seedlings from the previous crop, if diseased, are a possible source of secondary infection, they are only a few inches high at the critical period, and are often surrounded and overtopped by a dense growth of weeds and grass, so that it is difficult to understand how raindrops, or spray, could carry infection for more than a very limited distance. On the other hand, there is no doubt that in the Gezira infective dust and diseased cotton débris are carried to very considerable distances, and can reach the current season's cotton lands long before sowing.

During the season under review the blackarm disease was in no way confined to, or more prevalent on, the poorer land, or on cotton the vitality of which had been reduced by other causes.

Miles (L. E.) & Persons (T. D.). **Verticillium wilt of Cotton in Mississippi.**—*Phytopath.*, xxii, 9, pp. 767–773, 1 map, 1932.

A wilt of cotton in Mississippi, the symptoms of which are indistinguishable from those of *Fusarium vasinfectum*, was experimentally shown to be due to *Verticillium albo-atrum*, previously reported by Sherbakoff from Mississippi and Tennessee [*R.A.M.*, viii, p. 378; xi, p. 699]. The average incidence of infection on diseased plots kept under observation for the past four years was 62·82 per cent. in 1928, 80 in 1929, 35·53 in 1930, and 17·66 in 1931. In these plots, however, *F. vasinfectum* was also present and may have been responsible for some of the wilting in the early years, though

in 1931 it was not detected. None of the 18 standard varieties tested showed any appreciable degree of resistance to the disease, which was found in almost all cases on the heavy, sedimentary loam soils of the Mississippi Delta; one locality outside the Delta limits is situated on rich, loamy, bottom land. Of 706 wilted cotton plants from 37 counties, 626 yielded cultures of *F. vasinfectum* and the remaining 80 *V. albo-atrum*.

BUTLER (J. B.) & HUMPHRIES (ANNIE). **On the cultivation in artificial media of Catenaria anguillulae, a Chytridiacean parasite of the ova of the liver fluke, Fasciola hepatica.**—*Scient. Proc. Roy. Dublin Soc.*, xx (N.S.), 25, pp. 301–324, 6 pl., 1 fig., 1932.

A detailed account is given of the authors' experiments, in which they succeeded in growing *Catenaria anguillulae* [*R.A.M.*, vii, p. 375; viii, pp. 172, 571] on media prepared from agar, extract from liver-fluke (*Fasciola hepatica*) eggs ground either in a fresh condition between glass slides or ground after desiccation with kieselguhr, and flaked coagulated egg albumen. The outgrowths into the medium developed from sporangia contained in infected liver-fluke eggs, and at first resembled dehiscence tubes, which, however, failed to open, but gave a branched thallus on which new sporangia developed in the medium. The zoospores from these were successfully germinated on a medium composed of equal parts of agar, eggs ground with kieselguhr, and water, and gave rise to free thalli on which further sporangia formed and discharged.

In culture *C. anguillulae* produced a much more extensive growth than when occurring as a parasite of the liver-fluke eggs. In one case, a single thallus produced over 20 hyphal strands, each bearing, on an average, 3 to 4 sporangia; in another case, it was estimated that an outgrowth from an egg, possibly consisting of only one thallus, contained over 700 sporangia. There was no evidence of the presence of turbinate organs, and resting spores were seen in only two cases.

KANOUSE (BESSIE B.). **A physiological and morphological study of Saprolegnia parasitica.**—*Mycologia*, xxiv, 5, pp. 431–451, 2 pl., 1932.

Saprolegnia parasitica Coker, the species to which the author refers the fungus so frequently reported as injurious to fish in various parts of the world, was isolated from five species of fish from Michigan, and produced, on certain media of a reduced nutritive value, terminal or intercalary, hyaline, smooth, thin-walled, piriform to subspherical or spherical oogonia, 65 to 135 by 60 to 75 or 65 to 95 μ in diameter, with 1 to 5 small, clavate to subcylindrical antheridia borne on branches of diclinous or androgynous origin. The oospores are variable in number, of a rich golden-brown, and 18 to 22 μ in diameter. The production of this, previously unknown, sexual stage was stimulated by peptone in combination with leucin or maltose in solution, or with glucose or maltose in synthetic agar; it was also produced on sterilized hemp seed in water.

S. parasitica [a revised diagnosis of which is given] was not found to be a vigorous parasite on the eggs and young fry of trout kept under controlled conditions in the laboratory. Infection, when it did occur, was usually deferred until the vitality of the host was probably lowered.

BLANK (I. H.). **Studies of the physiology of molds. III. Molding of pickled sheep skins.**—*Journ. Amer. Leather Chem. Assoc.*, xxvii, 9, pp. 380–392, 4 pl., 1932.

The darkly pigmented hyphae of certain moulds, e.g., a species of *Hormodendrum*, were found to penetrate pickled sheep-skin hides so deeply as to cause permanent discoloration. A species of *Monilia* with green hyphae also grows into the skin. A yellow to red pigment produced by a species of *Penicillium* diffuses into the skin and is taken up by the fibres. The last two organisms are also characterized by proteolytic activity.

The effect of various concentrations of sodium chloride, mineral acids, and acetic acid on the growth of these and other moulds is described. Two types of pickle liquors have been prepared which give skins relatively resistant to moulding, viz., sodium chloride (6 gm. per 100 c.c. water), sulphuric acid (1·5 gm.), and sodium acetate (1 gm.); and sodium chloride, sulphuric acid (same amounts), and paranitrophenol (0·025 gm.).

WATTS (J. W.). **Torula infection: a review and report of two cases.**—*Amer. Journ. of Path.*, viii, 2, pp. 167–191, 5 pl., 1932.

Full clinical details are given of two fatal cases of human *Torula* infection. In the first, infection was generalized but the symptoms were almost entirely cerebral, while in the second embolic phenomena were present. Two strains of yeast-like bodies were isolated, one producing no pigment and the other forming a yellow one. Inoculation experiments on laboratory animals gave negative results. Entry is thought to be probably effected through the respiratory tract and dissemination to occur by means of the blood stream.

FUJII (S.). **Über die Erreger der Trichophytie am unbehaarten Körperteile in der Umgegend von Tokyo, insbesondere Sabouraudites ruber var. III.** [On the agents of trichophytosis of the hairless region of the body in the vicinity of Tokyo, especially *Sabouraudites ruber* var. III.]—*Japanese Journ. of Dermatol.*, xxxii, 9, pp. 775–784, 7 figs., 1932.

Sabouraudites asteroides [*Trichophyton mentagrophytes*: *R.A.M.*, ix, p. 593; x, p. 243; xi, p. 44] was identified as the agent in 363 of the 405 cases of trichophytosis investigated by the writer in and near Tokyo during 1930, the remainder being due to *S. ruber* (33), *Epidermophyton inguinale* [*E. floccosum*: see next abstract] (4), *S. interdigitalis* [*T. mentagrophytes*] (1), *Bodinia glabra* [*T. glabrum*: ibid., x, p. 596] (2), and a new variety of *S. ruber* (var. III), which produced a generalized eczematic condition of the body. The last-named fungus is characterized by deep brownish-purple colonies on Sabouraud's agar, undulating hyphae 4 μ in diameter, spores 4·5 μ in diameter (or 5 by 3·5 μ when elongated-

spherical), 4- to 8-septate spindles, chlamydospores 8·5 μ in diameter, and a few 'giant' spores (6·5 μ in diameter).

LOMHOLT (S.). **Zwei Fälle von Epidermophytie an den Füssen mit hämatogener Aussaat von Epidermophytiden an Händen, Armen und Beinen.** [Two cases of epidermophytosis of the feet with haematogenous extensions of epidermophytids on the hands, arms, and legs.]—*Dermatol. Wochenschr.*, xcv, 37, pp. 1325–1328, 3 figs., 1932.

Details are given of two cases of epidermophytosis of the feet, with haematogenous extensions of dysidrotic epidermophytids on the legs, arms, and hands. The causal organism was readily identified as Kaufmann-Wolf's fungus (*Epidermophyton interdigitale*) [*R.A.M.*, xi, pp. 44, 458]. In Denmark this condition has not yet assumed the proportions in which it is reported from the United States, but the recent examination of 97 Copenhagen students revealed infection by the above-mentioned fungus in 21 cases, by *E. inguinale* [*E. floccosum*: ibid., xi, p. 575] in 3, and by *Achorion quinckeanum* in one.

BURNHAM (C. R.). **The inheritance of Fusarium wilt resistance in Flax.**—*Journ. Amer. Soc. Agron.*, xxiv, 9, pp. 734–748, 2 diags., 1932.

Full details are given of a study conducted at the Department of Genetics, Wisconsin Agricultural Experiment Station, on the inheritance of resistance to flax wilt (*Fusarium lini*) [*R.A.M.*, xi, p. 182].

A field wilt test of selections from a collection of varieties of widely separated geographical origin indicated that certain strains are completely susceptible, others highly resistant, while some breed true for intermediate degrees of susceptibility. In the F_3 generation of the cross between the susceptible Williston Golden and a resistant Argentine selection, only a small percentage of the families were as resistant as the resistant parent, most of them falling into the highly susceptible group, while a few were intermediate. A slight indication was obtained of linkage between susceptibility and one of two duplicate factors for yellow seed-coat colour. Crosses between certain resistant strains of different origin showed a high percentage of wilt, suggesting that they may carry different factors for resistance, a matter of some importance in the breeding of new resistant strains. In a cross of two susceptible strains (American and Abyssinian), almost a third of the 46 F_3 families showed some degree of resistance, pointing to transgressive segregation. Tests in further generations, however, are necessary to elucidate this problem.

JENKINS (ANNA E.). **Rose anthracnose caused by Sphaceloma.**—*Journ. Agric. Res.*, xlv, 6, pp. 321–337, 7 pl., 6 figs., 1932.

This is a full account of the author's investigation, started in 1925, of the rose disease attributed by Passerini to *Phyllosticta rosarum* [*R.A.M.*, xi, p. 517], for which the common name 'rose anthracnose' suggested by Cobb in 1903 is accepted. A review of the literature, supported by the examination of numerous

herbarium and living specimens (the latter intercepted by the United States Customs) indicates that the disease occurs in practically every continent of the world. There are records of it in France in 1828 and in the United States in 1869. In spite of this, it appears to have escaped notice, or was confused with other rose diseases, especially black spot (*Diplocarpon rosae*) [ibid., xii, p. 25].

Besides the leaves, on which only it has been described heretofore, the disease also attacks the stems and blossoms. On the leaves the lesions are often dark purplish-black above, and are sometimes bordered by a narrow, dull, livid brown band, which is often their colour on the lower side. A white or ashen coloration may result from a lifting of the cuticle or from etiolation of the leaf tissue on the surface where the fungus first gained entrance, usually the upper surface. On the stems the lesions are considerably smaller than on the leaves (seldom over 2 mm. in diameter); they are usually circular or elongated along the stem, raised (sometimes depressed at the centre), dull livid brown, becoming white or ashen in the centre. The lesions on the blossom pedicels and hips resemble those on the stem, while on the calyx lobes they resemble the leaf lesions; so far, lesions on the petals have not been definitely diagnosed.

Since no perfect stage of the pathogen has yet been found, and its imperfect stage [morphological and cultural details of which are given] is typical of *Sphaceloma* rather than of *Phyllosticta*, the fungus is transferred to the former genus as *S. rosarum* n. comb. Inoculation experiments, supported by extensive observations in the United States, showed that, besides a large number of commercial varieties, the fungus attacks a wide range of wild species, and is of considerable economic importance. The inoculation of roses with *Elsinoe veneta* [ibid., xi, p. 724], with which the author previously identified *S. rosarum*, gave negative results, and the latter is now considered to be a distinct species.

TAUBENHAUS (J. J.) & EZEKIEL (W. N.). **On a new damping-off disease of Texas Bluebonnets.**—*Mycologia*, xxiv, 5, pp. 457–459, 1 fig., 1932.

Young Texas bluebonnet (*Lupinus texensis*) plants collected in the country and potted in a greenhouse at College Station, Texas, were attacked by a crown rot and damping-off disease which was shown by isolations and inoculations to be caused by *Pythium de Baryanum* and a species of *Rhizoctonia* culturally resembling *R.* [*Corticium*] *solani*. Both organisms were shown to be soil-borne, and to be controllable by steam sterilization of the soil and disinfection of the plants before transplanting.

NEWTON (W.), HASTINGS (R. J.), & BOSHER (J. E.). **Botrytis tulipae (Lib.) Lind. II. Bulb dips.**—*Scient. Agric.*, xiii, 2, pp. 110–113, 1 fig., 1932.

Experiments [some details of which are given] showed that immersion for one hour in mercuric chloride or uspulun solutions (the *dosis curativa* and *dosis tolerata* of which were shown to be 0·03 and 0·1, and 0·5 and 1·5 per cent., respectively) gave the best and safest disinfection of tulip bulbs against *Botrytis tulipae*

[*R.A.M.*, xi, p. 460]; it also gave the best protection against soil-borne infection. Copper sulphate and potassium resin polysulphide [ibid., x, p. 198] proved to be unsuitable, as they caused injury to the plants at concentrations ineffective against the fungus.

LANDGRAF (T.). **Die Stammfäule oder Fusskrankheit der Sinningia (Gloxinia.)** [The stem rot or foot disease of *Sinningia* (*Gloxinia*).]—*Blumen- und Pflanzenbau*, xlvii, 9, pp. 134–135, 1 fig., 1932.

Gloxinias in the Hamburg district are reported to have suffered considerably of recent years from the attacks of the so-called 'propagation fungi', including *Pythium*, *Phytophthora*, *Botrytis*, and *Moniliopsis* spp. The first symptom of infection is a relatively inconspicuous discoloration of the basal leaves, which is rapidly followed by wilting and eventually by the collapse of the whole plant. Closer examination reveals a greenish- to brownish-black discoloration of the basal parts of the stem, the epidermal tissues of which are rotted. Subsequently infection spreads to the bulb as well as to the aerial parts of the plant. The popular blue-flowering varieties are much more susceptible than the white, for which there is little demand. Good control (reduction of losses from 100 to 25 per cent.) was effected by placing sand around the underground parts of the stem.

ADAM (D. B.). **Rust disease in Boronia.**—*Journ. Dept. Agric. Victoria*, xxx, 8, pp. 389, 391, 1932.

A popular note is given on the rust of the perennial sweet-scented *Boronia megastigma* (widely cultivated in Australia on a commercial scale) due to *Puccinia boroniae*, and on its control by propagation from resistant seedlings.

NICOLAS (G.) & AGGÉRY (Mlle). **Une maladie du Laurier-Cerise en Suisse.** [A disease of the Cherry-Laurel in Switzerland.] —*Rev. Path. Vég. et Ent. Agric.*, xix, 4, pp. 174–176, 1 fig. (on pl. facing p. 172), 1932.

The examination of diseased leaves of cherry-laurel [*Prunus laurocerasus*] sent in from Switzerland in 1931, failed to show the presence in the still living but discoloured tissues of a fungal mycelium, while the dead, grey tissues were invaded by an unidentified species of *Heterosporium*, a few morphological details of which are given. The presence in the living tissues of very numerous bacteria (which were not more closely studied) leads the authors to believe that these are the primary cause of the disease, resulting in a severe stunting and yellowing of the leaves, and that the *Heterosporium* is only a secondary infection developing on the moribund tissues. Lack of material prevented them from making inoculation experiments.

BURKHOLDER (W. H.) & GUTERMAN (C. E. F.). **Synergism in a bacterial disease of Hedera helix.**—*Phytopath.*, xxii, 9, pp. 781–784, 1932.

Two distinct types of bacteria were isolated from single lesions on ivy (*Hedera helix*) leaves among a consignment sent from

Georgia to a New York firm. Both the organisms produced round, yellow colonies on beef extract-agar, but one was of a paler colour and grew less rapidly than the other. Inoculation tests showed that only the former was pathogenic when used alone.

It is evident from a comparison of the present symptoms with those of previously described bacterial diseases of ivy in Germany [cf. *R.A.M.*, vi, p. 298], France, and the United States, that the same disease is involved. Water soaked spots appear on the leaves, later developing dark brown to black centres (which crack as they become dry) and reddish-purple margins. The non-pathogenic bacterium, though innocuous alone, acted as a temporary accelerator when combined with the slow growing pathogen. The latter, used alone or with the rapidly growing non-pathogenic organism, produced practically 100 per cent. infection.

The pathogen, to which the name of *Phytomonas hederae* is given, is a slender rod, Gram-negative, motile by means of a single polar flagellum, non-sporulating, 2·13 by 0·6 μ, forming amber-yellow, watery to butyrous colonies on beef extract-agar, turning milk alkaline, liquefying gelatine, producing ammonia in peptone broth, fermenting dextrose, levulose, galactose, xylose, lactose, sucrose, and glycerol without gas, as well as the sodium salts of acetic, citric, lactic, malic, and succinic acids, and facultatively anaerobic.

The accelerator, which is not named but appears to resemble *Bact. herbicola aureum* [ibid., v, p. 162], is a short rod, sometimes oval with a central granule, Gram-negative, motile by means of one or two polar flagella, non-sporulating, 1·7 by 0·9 μ, forming antimony-yellow, butyrous colonies on beef extract-agar, turning milk first alkaline, later neutral or slightly acid, producing ammonia in peptone broth, fermenting dextrose, levulose, galactose, arabinose, xylose, rhamnose, sucrose, glycerin, mannitol, and salicin without gas, as well as the above-mentioned sodium salts, and facultatively anaerobic.

VERONA (O.). **Note micologiche sulle Pandanacee.** [Mycological notes on the Pandanaceae.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxix, 3, pp. 454–476, 9 figs., 1932.

Notes are given on a collection of fungi on species of Pandanaceae from various parts of the world, together with a few on Freycinetiae. Several new species are described, including *Dimerosporium pandani* on withered leaves of *Pandanus lamboensis* and *Gloeosporium pandani* on the pericarp of withered fruits of the same host, both from Upolu (Samoa Islands). The former is characterized by gregarious, superficial, carbonaceous, irregularly ruptured, globose or depressed perithecia arranged in a gradually enlarging black spot on the under surface of the leaves; the spheroidal or subspheroidal asci measured 48 to 52 μ in diameter and contained eight ovoid, uniseptate, hyaline spores measuring 32 by 16 μ. *G. pandani* showed black, subcutaneous, then erumpent acervuli, ovoid, hyaline conidia measuring 9 to 10 by 4·5 to 6 μ, and fasciculated, simple, short, continuous, hyaline or subhyaline conidiophores.

NISIKADO (Y.). **Beiträge zur physiologischen Spezialisierung Obstfäule erregender Fusarien.** [Contributions to the physiologic specialization of the *Fusaria* causing fruit rot.]—*Zeitschr. für Parasitenkunde*, iv, 2, pp. 301–330, 3 figs., 1932.

This is a slightly condensed version of the writer's investigations on physiologic specialization in the fruit-rotting fungi *Fusarium lateritium* [*Gibberella moricola*] from citrus and raspberry, *F. lateritium* var. *fructigenum* from apple, citrus, and *Salix*, and *F. oxysporum* from various sources, a full account of which has already been noticed [*R.A.M.*, xi, p. 306].

WORMALD (H.). **Blossom wilt of fruit trees.**—*Journ. Min. Agric.*, xxxix, 7, pp. 620–626, 1 pl., 1932.

Referring to the serious reduction in the 1932 crops of cherries, plums, and apples in England caused by severe outbreaks of blossom wilt (*Sclerotinia cinerea*) [cf. *R.A.M.*, xi, p. 58], the author gives a brief outline of the factors that favour the development of the disease on fruit trees in the spring, and also a concise description of the symptoms produced in the different hosts [ibid., xi, p. 311]. Among the measures recommended for the control of the trouble, stress is laid on the routine cutting out of brown rot cankers, and of all infected spurs and twigs.

CHANDLER (W. H.), HOAGLAND (D. R.), & HIBBARD (P. L.). **Little-leaf or rosette in fruit trees.**—*Proc. Amer. Soc. Hort. Sci. 1931*, xxviii, pp. 556–560, 1 pl., 1932.

The disorder known as 'little leaf', which affects all the stone fruits, as well as walnuts, citrus, grapes, and other plants in California [*R.A.M.*, viii, pp. 208, 550; x, p. 324; xi, p. 570], is thought to be probably identical with that described from Washington and elsewhere on apples as 'rosette' [ibid., iii, p. 341], but the continued use of the former term is recommended in order to avoid confusion with peach rosette [ibid., x, p. 601]. The trees most likely to be affected are those growing on deep, well-drained, sandy or gravelly soils with a relatively small admixture of clay and a hydrogen-ion concentration between P_H 6·8 and 8. In Washington uniformly satisfactory results in reducing the trouble have been obtained by the continuous cultivation of lucerne in orchards, while in California this practice has not been invariably successful, though recovery has taken place in a fair number of peach, apricot, and plum trees after some three years in a good lucerne stand. In experiments started in 1928, some details of which are given, it was found that applications of ferrous sulphate to the soil around diseased trees led to an improvement, which is believed to be largely due to the presence of a certain amount of zinc sulphate, no benefit following treatment with chemically pure ferrous sulphate. When Belgian ferrous sulphate was applied, containing a much lower proportion of zinc sulphate than the American, the resultant improvement was correspondingly less. Ferrous sulphate forced into the soil through a pipe attached to a spray machine was much less effective in the correction of little leaf than when spread over the surface of the soil in a radius of 3 to 4 ft. from the trunk. When the amount of zinc was adequate

the application always corrected the trouble, no matter what kind of tree was treated. It is believed that the action of the zinc is indirect, either by neutralizing some injurious substance in the soil or by affecting the soil flora.

SHERBAKOFF (C. D.). **The more important diseases of Apples in Tennessee.**—*Tennessee Agric. Exper. Stat. Bull.* 145, 54 pp., 11 figs., 1 diag., 1932.

Popular notes are given on the symptoms, mode of infection, and control of the following apple diseases in Tennessee: blotch [*Phyllosticta solitaria*], scab [*Venturia inaequalis*], bitter rot [*Glomerella cingulata*], black rot [*Physalospora cydoniae*], fire-blight [*Bacillus amylovorus*], rusts [*Gymnosporangium juniperi-virginianae, G. germinale*, and *G. globosum*: *R.A.M.*, xi, p. 412 and next abstract], blister canker [*Nummularia discreta*: ibid., ix, p. 461], black root rot [*Xylaria polymorpha*: ibid., vii, p. 465], and bitter pit. The bulletin further contains numerous observations on varietal reaction to the above-mentioned diseases and much useful information on local spraying schedules, the relative merits and mode of application of different fungicides, and orchard sanitation.

MILLER (P. R.). **Pathogenicity of three Red-Cedar rusts that occur on Apple.**—*Phytopath.*, xxii, 9, pp. 723–740, 2 figs., 1932.

This is an expanded account of the author's studies in Indiana on the pathogenicity of three species of *Gymnosporangium* infecting apples, viz., *G. germinale*, *G. juniperi-virginianae*, and *G. globosum* [see preceding abstract], a preliminary note on which has already appeared [*R.A.M.*, x, p. 391]. The optimum temperature for teleutospore and basidiospore germination in all three species was found to be 24° and 16° C. respectively; the aecidiospores of *G. juniperi-virginianae* and *G. globosum* germinated best at 24° and those of *G. germinale* at 16°. The aecidiospores of *G. juniperi-virginianae* survived the winter and germinated well in March or April, some being viable as long as a year after collection.

GOODWIN (W.), SALMON (E. S.), & WARE (W. M.). **The control of Apple scab on Worcester Pearmain and Allington Pippin; a three years' experiment.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxx, pp. 28–50, 4 figs., 1 plan, 1932.

In a spraying test against scab [*Venturia inaequalis*: cf. *R.A.M.*, xi, p. 113] conducted in Kent in 1929, Worcester Pearmain and Allington Pippin apple trees after one pre- and two post-blossom applications of home-made Bordeaux mixture (8–12–100) yielded, respectively, 76 and 65 per cent. by weight of clean fruit, the corresponding figures for the unsprayed controls being only 19 and 12 per cent. About 15 per cent. by weight of the Worcester Pearmain apples showed distinct russeting. In the following year a pre-blossom application of Bordeaux mixture (8–8–100) and two post-blossom applications (8–12–100) gave 96·1 per cent. clean Worcester Pearmain fruit and 86·2 per cent. clean Allington

Pippins; when lime-sulphur (1 in 60) was substituted for Bordeaux in the two post-blossom applications, the corresponding figures were 83·8 and 88·4 per cent., as against 48·5 and 24·3 per cent. in the unsprayed controls. On the Worcester Pearmain trees the Bordeaux mixture alone and the same followed by lime-sulphur gave, respectively, 7·9 and 4 per cent. by weight russeted fruit, as compared with 0·8 per cent. in the unsprayed controls. On the Allington Pippin trees the Bordeaux mixture alone caused only negligible russeting, while the same followed by lime-sulphur gave 2·6 per cent. russeted fruit, as compared with 0·3 per cent. in the controls. In 1931, three applications of Bordeaux mixture (8–12–100) gave 87·5 and 73·7 per cent. clean fruit on the Worcester Pearmain and Allington Pippin trees, respectively, the controls giving 8·6 and 7·5 per cent. One pre-blossom application of lime-sulphur (1 in 30) with two post-blossom applications (1 in 60) gave 45·8 and 55·7 per cent. clean fruit on the Worcester Pearmain and Allington Pippin trees, respectively. On the former variety the Bordeaux treatment gave 7·3 per cent., and the lime-sulphur 1·36 per cent. (by number) severely russeted apples, as against 0·24 per cent. in the controls; on the Allington Pippin trees the Bordeaux mixture caused only negligible russeting, and the lime-sulphur still less.

It is concluded that with both varieties home-made Bordeaux mixture is more effective than lime-sulphur against scab. Bordeaux mixture may, however, cause serious russeting and discoloration on Worcester Pearmain apples, and where a high finish is required on this variety lime-sulphur should be substituted. It is considered that to obtain complete control two pre-blossom applications would have been required.

Goodwin (W.), Salmon (E. S.), & Ware (W. M.). **The control of Apple Scab. I. Allington Pippin and Newton Wonder.**— *Journ. South-Eastern Agric. Coll., Wye, Kent*, xxx, pp. 51–62, 1 fig., 1932.

In further spraying tests against apple scab [*Venturia inaequalis*: see preceding abstract] conducted in Kent in 1931, Allington Pippin trees given one pre- and two post-blossom applications of Bordeaux mixture (8–12–100) and those given one pre-blossom application of lime-sulphur (1 in 30) followed by two post-blossom applications at 1 in 100 [cf. *R.A.M.*, xi, p. 114] yielded, respectively, 75 and 33 per cent. scab-free fruit, as compared with 9 per cent. in the unsprayed controls, only 1·46 per cent. of the fruit from the trees sprayed with the Bordeaux mixture being appreciably russeted. When the same treatments were given to Newton Wonder trees, those sprayed with Bordeaux mixture gave 50·7 per cent. and those with lime-sulphur 2·7 per cent. clean fruit, as compared with 0·8 per cent. in the controls. The attack appeared to be much more severe on the Newton Wonder trees than on the Allington Pippins. The poor results obtained from the Bordeaux mixture on the former variety are considered to indicate that in years when scab is as severe as in 1931 an extra pre-blossom application should have been made, before the first actually given,

or possibly an additional late one, after the second post-blossom application.

As lime-sulphur, unless much diluted, may cause defoliation on Newton Wonder trees, and as good or fair control had been obtained in previous seasons, Bordeaux mixture is still recommended for this variety.

The rapidity with which the disease spread late in the season is illustrated by the fact that one plot of Allington and Newton Wonder trees, in which on 28th July approximately 70 and 85 to 90 per cent., respectively, of the apples appeared to be scab-free, at picking time showed only 33 and 3 per cent., respectively, clean fruit.

PIERSTORFF (A. L.). **A centralized scab-spray service.**—*Phytopath.*, xxii, 9, pp. 759–766, 1 fig., 1 map, 1932.

Details are given of the mode of organization of the apple scab [*Venturia inaequalis*] spray service in Ohio [*R.A.M.*, ix, p. 726]. Thanks to improvements in the telephonic, telegraphic, and broadcasting systems of communication, it has been possible to adopt a centralized plan, whereby one individual, in consultation with other pathologists and co-operators in different parts of the State, makes recommendations for the time of application of the various sprays. The notifications are based on three factors, viz., the stage of fruit bud development, the percentage of mature ascospores of the fungus, and the probable weather for the next two or three days [cf. ibid., x, p. 776; xi, p. 309]. The average percentage of disease-free fruit harvested from 1928 to 1931, inclusive, by a group of about 100 growers following the official recommendations was 95·75.

BROOKS (C.), MILLER (E. V.), BRATLEY (C. O.), COOLEY (J. S.), MOOK (P. V.), & JOHNSON (H. B.). **Effect of solid and gaseous carbon dioxide upon transit diseases of certain fruits and vegetables.**—*U.S. Dept. Agric. Tech. Bull.* 318, 59 pp., 34 graphs, 1932.

With strawberries at a temperature range of 32° to 77° F., the transit rots caused by *Botrytis cinerea* and *Rhizopus nigricans* [*R.A.M.*, x, p. 254; xi, p. 585] were fairly well inhibited by 23 per cent. of carbon dioxide and completely controlled by 37 per cent. or more of the gas. In inoculation tests *B. cinerea* on Bartlett pears and *Monilia* on Italian prunes were entirely checked by 20 to 30 per cent. carbon dioxide and considerably inhibited by 12 to 15 per cent. [cf. ibid., ix, pp. 533, 534]. In a series of experiments with *Sclerotinia fructicola* [*S. americana*] on peaches [ibid., x, p. 192], it was found that within the range of 10 to 50 per cent. carbon dioxide the average reduction in the virulence of the fungus was about twice that of the percentage of gas used. At 77°, within a range of 10 to 40 per cent., the carbon dioxide produced an effect on the rot approximately equivalent to that of reducing the temperature as many degrees as the percentages used. At lower temperatures the loss of virulence of the fungus was as great, if not greater. Good control was also given of internal breakdown in Bartlett pears [ibid., ix, p. 254] and of

soft scald [ibid., xi, pp. 53–5] and other diseases in Grimes Golden, Delicious, and Jonathan apples by carbon dioxide treatment, which further proved effective against *B. cinerea* in grapes.

The experiments were carried out in refrigerators at constant temperatures with a constant percentage of carbon dioxide, and also in standard refrigerator cars. Solid carbon dioxide was used as a supplementary refrigerant and as a source of the gas. Limitations to this otherwise successful treatment are set by its objectionable effects on the flavour of the fruit, especially in the case of peaches, apricots, strawberries, and red raspberries. Grapes, peas, maize, and carrots showed no adverse effects as a result of the treatment, while plums, cherries, apples, pears, currants, oranges, and certain other fruits were intermediate in this respect.

WORMALD (H.). **Apples should be picked with their stalks!**—*Gard. Chron.*, xcii, 2385, p. 200, 2 figs., 1932.

A case of brown rot (*Sclerotinia fructigena*) in Sussex apples of the Early Victoria, Grenadier, and Gladstone varieties, due to careless picking, is briefly described. As in a similar instance reported in 1927 [*R.A.M.*, v, p. 178], the infection was found to arise at the wounds made by picking the fruits away from the stalk instead of with it. The rot developed on the apples in the market on 11th August, picking having been commenced three days previously. *S. fructigena* was readily isolated in the laboratory from the diseased fruit.

ALLEN (F. W.). **Maturity and rate of ripening of Gravenstein Apples in relation to bitter pit development.**—*Proc. Amer. Soc. Hort. Sci. 1931*, xxviii, pp. 639–645, 4 diags., 1932.

The writer has previously shown (*Proc. Amer. Soc. Hort. Sci.*, 1930) that Gravenstein apples held for immediate ripening developed less bitter pit at 70° F. than at 50°, and similar results were obtained in 1931 in tests with fruit kept for ten days at 32°, 50°, and 70° and subsequently removed to a temperature of 70° to 75° for ripening. The low temperature (32°) retarded the initial development of bitter pit, but failed to maintain the fruit in good condition after its removal from storage, while the apples kept continuously at 70° or higher were least affected by the disease during the time they were in the best state for eating. In connexion with Carne's theory as to the role of starch in the causation of bitter pit [*R.A.M.*, vii, p. 102; x, p. 115], it may be mentioned that the starch content of the apples held for ten days at 70° was only half that of comparable lots at 50°, at which temperature the fruit became most severely disorganized. Some indication was given that ethylene gas (three treatments at 1 in 1,000) decreases the incidence of bitter pit by accelerating starch dispersion.

DAVIS (L. D.) & TUFTS (W. P.). **Black-end and its occurrence in selected Pear orchards.**—*Proc. Amer. Soc. Hort. Sci. 1931*, xxviii, pp. 634–638, 1 diag., 1932.

Individual tree records have been made since 1929 in a number of Californian Bartlett pear orchards in which black-end occurs

[*R.A.M.*, vi, p. 493]. The results [which are tabulated and discussed] showed that the distribution of the affected trees in the orchard is of a purely random character irrespective of the type of soil, an observation that points to the implication of factors as yet unknown. Trees producing black-end fruit in one year generally continued to do so in succeeding seasons, while the relative severity of the condition on a given tree was also maintained from year to year. The largest number of black-end trees occurred among those on *Pyrus serotina* rootstocks, Kieffer seedling coming next in this respect and *P. ussuriensis* producing the lowest incidence. In 1931 it was found that the first black-end fruits were formed on trees showing the highest amount of disease in the previous year.

MILLS (W. D.). **A severe outbreak of leaf rust on cultivated Raspberry in New York.**—*Plant Disease Reporter*, xv, 13, pp. 135–136, 1931. [Mimeographed. Received December, 1932.]

Latham red raspberries in Herkimer County, New York, were found in September, 1931, to be severely infected by *Puccinastrum americanum* [*R.A.M.*, iii, p. 218; ix, p. 73], which had evidently spread from a row of wild raspberries bordering the planting. The under leaf surfaces up to the terminal foot of every cane were covered with the yellow spores of the rust. Over 5,000 plants were attacked. One leaf of an adjacent Cumberland black raspberry [*Rubus occidentalis*] also bore a lesion due to *P. americanum*. Wild red raspberries in other parts of the county were also attacked by the rust, but much less severely than the cultivated Latham, while the wild black ones were free from this rust but bore abundant teleutosori of *Gymnoconia interstitialis* [ibid., x, pp. 116, 164].

[SUTHERLAND (J. B.).] **Banana breeding, etc.**—*Journ. Jamaica Agric. Soc.*, xxxvi, 9, pp. 463–465, 1932.

In a lecture describing his efforts to evolve a banana in Jamaica resistant to Panama disease [*Fusarium oxysporum cubense*: cf. *R.A.M.*, xii, p. 39] the author, who is in charge of the banana breeding work in the island, stated that in 1924 he planted several varieties obtained from Kew, and made numerous crosses with the Jamaica banana and others, some of which produced viable seed. The seedlings 7, 17, 19, and 40 were all very promising, Gros Michel × Robusta being the most successful cross.

WARDLAW (C. W.) & MCGUIRE (L. P.). **Control of wastage in Bananas with special reference to time and temperature factors.**—*Empire Marketing Board Publ.* 60, 103 pp., 25 pl., 11 graphs, 1932.

In the section of this report [cf. *R.A.M.*, xi, pp. 382, 383, 464, 727] dealing with time and temperature factors in relation to fungal infection of stored bananas [ibid., x, p. 806] it is stated that fungal wastage in storage is primarily due to mechanical injury sustained during handling, and to atmospheric humidity prevailing when infection is probable. Fungal activities can be kept

sufficiently in abeyance provided that the interval between picking and loading is short, and that the fruit is rapidly cooled down to 53° F.

In inoculation experiments with *Botryodiplodia theobromae* (by far the most active of the rotting fungi encountered) [cf. ibid., xi, p. 190] at various temperatures and degrees of ripeness, it was found that on 'heavy full' grade fruit (the ripest used in transport) the fungus in only four days at 82° to 83° produced chocolate-coloured skin blemishes 2 to 3 cm. long, rendering the fruit very unsightly and causing premature ripening; a characteristic brown, semi-liquid decay was also already present in the underlying flesh. On '½ full' grade fruit, sunken brown skin blemishes were produced, soon accompanied by premature yellowing, though the underlying flesh was as yet unaffected. When the same two grades of fruit were kept at 53° from the outset or placed at that temperature after one day at 76°, no blemishes were noted. When the inoculated fruit was exposed for three days at 76° before being transferred to 53°, the initial growth of the fungus was sufficient to show that serious rotting during the usual storage period was inevitable.

On a standard synthetic medium *B. theobromae* at 82° grew at the rate of 4 cm. a day; at 76° and 70° growth was proportionately slower, and at 53° it amounted to only 0·6 cm. per day. The injury to fruit at the higher temperatures is due both to accelerated ripening and increased rate of fungal growth.

Inoculated 'heavy full' fruit kept for seven or eight days at 53° and then for four days at 70°, ripened normally, and remained free from significant fungal damage.

Even when *B. theobromae* was applied to freshly made wounds under conditions highly favourable to disease production, infection was largely prevented by rapid cooling to 53°. Fruit on which fungal activity had been kept at a minimum during cool storage suffered severely in some instances by slow ripening at 70°; with '¾ full' fruit (the usual grade for export to England), free from blemish when transferred to 70°, serious fungal invasion took place between the seventh and tenth days in the ripening room. When the fungus had made a good start at tropical temperatures, even the most rapid cooling to 53° did not wholly arrest its further progress, though rapid cooling of the fruit flesh to between 53° and 55° does afford a very satisfactory degree of control, and should, if possible, be effected in two days.

Mycologically, the degree of atmospheric humidity in the ship's hold is of the utmost importance, especially during the initial stages of an attack, when pathogens are becoming established in the tissues. When *B. theobromae* was applied on culture jelly almost every inoculation produced infections at favourable temperatures, but when spore suspensions in water were used under similar conditions, 10 per cent. only of the inoculations were successful when humidity was low.

When bananas kept for one day at 82°, then for two days at 60°, then up to the sixteenth day at 53°, and transferred on the seventeenth day to 70° (thus simulating transport to England and ripening there) were wounded and inoculated on the first, eighth,

twelfth, fifteenth, and seventeenth days, respectively, the greatest wastage resulted from inoculations on the first day. Infections developing on board ship may ultimately entail less waste than wounds acquired and infected after the voyage, while the fruit is being transported to or is in the ripening rooms.

Earlier investigations having demonstrated that finger-dropping may be caused by rots spreading from the main stalk, experiments were carried out by inoculating the stalk just above the finger cushion with *B. theobromae*, and storing at 53° after one day at 82° (control), or one day at 82° and two days at 60° (rapid cooling), or one day each at 82° and 70°, then two days at 65° and two at 60° (slow cooling), a fourth lot being stored at 53° and wounded and inoculated on the fifth day. All were removed to 70° on the seventeenth day. The total percentages of affected finger stalks for the four lots were, respectively, 16, 20, 54, and 11, the corresponding figures for the percentages of dropped fingers after eight days in the ripening room being 0, 4, 28, and 0. Rapid cooling reduces this source of finger dropping.

In tests [which are described] of the efficacy of the vaseline treatment against main stalk rotting [ibid., x, p. 45; xi, p. 63] under trade conditions, the comparatively good results obtained with freshly trimmed, unvaselined stalks indicated that freedom from extensive rotting was mainly due to rapid cooling, and that the beneficial effects of the vaseline smear chiefly result from the fact that it keeps out fallen spores and prevents desiccation and cracking of the stalks, which would otherwise facilitate fungal penetration.

A list is given of 35 fungi associated with main stalk rot and banana fruit rots in general.

MEHRLICH (F. P.). **Pseudopythium phytophthoron a synonym of Phytophthora cinnamomi.**—*Mycologia*, xxiv, 5, pp. 453–454, 1932.

The author states that in his study of the pineapple diseases associated with the fungus which was tentatively named by Sideris and Paxton *Pseudopythium phytophthoron* [*R.A.M.*, x, pp. 325, 740], he obtained the zoosporangial stage which was not observed by the previous writers. All the morphological details of the organism agree well with Rand's description of *Phytophthora cinnamomi* [ibid., i, p. 246], and its pathogenicity conforms to that indicated by Tucker for the latter species [ibid., x, p. 754]. Subcultures of the fungus were independently identified by Leonian and by Tucker as *P. cinnamomi*. On submission to Sideris these facts induced him to withhold the description of *P. phytophthoron* from publication; this binomial thus remains a *nomen nudum*.

WILCOXON (F.) & MCCALLAN (S. E. A.). **The fungicidal action of sulphur. IV. Comparative toxicity of sulphur, selenium, and tellurium.**—*Contrib. Boyce Thompson Inst.*, iv, 3, pp. 415–424, 1 fig., 5 graphs, 1932.

Continuing their studies on the fungicidal action of sulphur, which is attributed to the reduction of sulphur vapour to toxic hydrogen sulphide by the fungus spores [*R.A.M.*, xi, p. 385], the

writers investigated the comparative toxicity of sulphur and its chemically analogous elements, tellurium and selenium.

The tests were carried out with red and black (purified) and technical selenium, tellurium, and 'straight' commercial sulphur [see next abstract] dusts on the spores of *Sclerotinia americana*, *Pestalozzia stellata*, and *Uromyces caryophyllinus* [ibid., xi, p. 730]. Tellurium was found to be much less toxic than sulphur, and even in colloidal form selenium showed no appreciable fungicidal activity. The toxicity of hydrogen selenide, however, while difficult to gauge accurately on account of its instability, was apparently comparable to that of hydrogen sulphide. The formation of hydrogen selenide and of hydrogen telluride by yeast cells or glutathione was less readily effected than the reduction of sulphur to hydrogen sulphide under similar conditions.

ADAMS (J. F.). **Bacterial and fungous flora in certain sulphur fungicides.**—*Phytopath.*, xxii, 9, pp. 785–786, 1932.

In the course of toxicity tests with certain sulphur fungicides, the latter were found to be contaminated by various organisms. Representative samples of 14 fungicides were examined, including mixtures of 'straight' elemental sulphur [*R.A.M.*, xi, p. 385], modified sulphurs (containing admixtures of hydrated lime and wettable agents), and suspended sulphurs. Some of the mixtures showed bacteria in numbers exceeding 1,000,000 and fungi up to 30,000 per gm. The bacteria were mostly of the *Bacterium fluorescens* group, while the fungi were species of *Aspergillus* and *Penicillium*. The contaminants occurred chiefly in the older samples (two years or more) of modified sulphurs to which caseinate and similar substances are added to improve the wetting and physical properties. Suspended sulphurs, especially from by-products in gas manufacturing [cf. ibid., ix, pp. 580, 796], showed the heaviest bacterial flora.

Plant pathology at the Rockefeller Institute for Medical Research, Princeton, New Jersey.—*Science*, N.S., lxxvi, 1968, p. 250, 1932.

The Division of Plant Pathology of the Rockefeller Institute for Medical Research was due to commence work on 1st October, 1932. The accommodation provided for the division consists of a laboratory, eight greenhouses, and a potting shed; and Dr. L. O. Kunkel has been appointed head.

WILSON (J. D.). **Environmental factors in relation to plant disease and injury: a bibliography.**—*Ohio Agric. Exper. Stat. Tech. Ser. Bull.* 9, 203 pp., 1932.

This extremely useful bibliography, of 3,689 titles, arranged alphabetically under authors, comprises some of the papers in botanical literature referring to the injurious influence of environmental factors on plants. The factors considered are separately indexed in the second section of the bulletin, while the diseases, injuries, and abnormalities discussed are indicated for each host in the third, which also includes, under the name of the pathogen, a list of the papers in which the action of the factor on the

pathogen only, without reference to the host, is discussed. A host index of scientific and popular names is appended.

JARVIS (T. D.). **The environmental coincidence as a factor in incidence and control of plant diseases.**—*Scient. Agric.*, xiii, 1, pp. 36–57, 1932.

This is a discussion of the evidence supplied by recent phytopathological investigations [a survey of which is given], that variations in the incidence and external expression of physiological, virus, and parasitic diseases of plants may be explained, in a large measure, in terms of the basic metabolic disturbances brought about in the plants under the influence of different complexes of environmental conditions, which the author terms environmental coincidence, and which affect the predisposition of the plant either for resistance or susceptibility. In his opinion, a better understanding of the problem of the incidence and control of plant diseases may be attained by a world-wide and international study of the ecological conditions best adapted for growing a given crop, the fundamental principles of which are briefly indicated.

JOHNSON (J.) & GRANT (T. J.). **The properties of plant viruses from different host species.**—*Phytopath.*, xxii, 9, pp. 741–757, 1932.

In order to examine some characteristic properties of viruses from different plants, a number of susceptible hosts were inoculated with the specific viruses to be tested. When infection on these plants was evident, extracts were made and treated as desired, after which inoculations were made on a series of tobacco plants to ascertain the effect of the treatment on the virus.

Four viruses were used in the study, namely, ordinary tobacco mosaic (tobacco virus 1), cucumber mosaic (cucumber virus 1) [*R.A.M.*, vi, p. 501], Wingard's tobacco ring spot [see below, p. 120], and 'spot necrosis', now recognized as a combination of two viruses [ibid., x, p. 682], special attention being paid to the 'mottle' virus constituent of the compound. Most of the plants used to test the effect of the host on these viruses were members of the Solanaceae, but cucumber and some others were added. The four properties selected for investigation were the thermal death-point, longevity *in vitro*, tolerance to dilution, and resistance to certain chemicals.

The results of the studies [which are fully discussed and tabulated] showed that in most of the hosts tested the thermal death-point for the tobacco mosaic virus is below 90° C. In no case did the cucumber mosaic virus survive 75°, and it was frequently inactivated at 60° or 65°. The thermal death-point of 'mottle' was found to be below 70° in most cases, while that of the 'spot necrosis' combination of viruses was 5° or 10° lower. The tobacco ring spot virus uniformly survived a temperature of 60°, but from some hosts it was destroyed at 65° and it never withstood 70°, so that its thermal death-point may perhaps be placed at 63° to 68°. Doolittle found (*U.S. Dept. of Agric. Bull.* 879, 1920) that the cucumber mosaic virus was never infectious after three to five days and usually lost its virulence within 24 to 48 hours. Similar results were obtained in the present trials with this virus; *Physalis*

pubescens tends to shorten its life to less than one day, while *Nicotiana sylvestris* and *N. glutinosa* may prolong viability beyond three days.

Tobacco mosaic extracts from all hosts, when diluted to 1 in 1,000,000, gave good infection, except those from *S. nigrum*, which showed considerable weakening at this dilution. Some instances of infection with the cucumber mosaic virus occurred at 1 in 100,000, but generally speaking there was a marked decline at 1 in 10,000. The tobacco mosaic virus proved completely resistant in all tests to the action of nitric acid (1 in 200) and 50 per cent. ethyl alcohol for 48 hours, while cucumber mosaic was largely inactivated by one hour's exposure to these treatments and entirely by 24 hours.

On the whole the results showed that the properties of the different viruses tested are not greatly modified through the influence of the host plant.

PORTER (C. L.). **Mixed cultures of bacteria and fungi.**—*Proc. Indiana Acad. Sci.*, xli, pp. 149–152, 1932.

In the author's studies of the influence on one another of certain bacteria and fungi in mixed cultures on potato dextrose agar at 22° C. [cf. *R.A.M.*, v, p. 247] it was found that *Bacillus mesentericus vulgatus* and a bacterial spreader of the *proteus* type acted as 'inhibitors' to the growth of the following organisms: *Colletotrichum nigrum*, *Brachysporium* sp., *Helminthosporium gramineum*, *H. inaequalis*, *Physalospora cydoniae*, *Botrytis allii*, *B. paeoniae*, *B. tulipae*, *Rhizoctonia* from potato [*Corticium solani*], *Fusarium niveum* [ibid., xi, p. 558], *Thielavia basicola*, *Sclerotinia fructigena*, *Pythium de Baryanum*, *Cephalothecium* [*Trichothecium*] *roseum* [ibid., x, p. 321], and *Penicillium* sp. Both the 'inhibitors' also exercised their preventive effect at a distance on *Glomerella cingulata* and *Sclerotium rolfsii*, whereas *Basisporium gallarum* [*Nigrospora sphaerica*] was unaffected and continued to grow over the bacterial colonies. The development of the three last-named fungi was restricted to some extent by *Pseudomonas campestris* and that of *N. sphaerica* and *G. cingulata* also by *Bacillus carotovorus*.

ALBRECHT (W. A.) & JENNY (H.). **Available soil calcium in relation to 'damping off' of Soy Bean seedlings.**—*Bot. Gaz.*, xcii, 3, pp. 263–278, 4 figs., 6 graphs, 1931.

In some studies at Columbia, Missouri, on the effects of the soil calcium, as distinct from those of the hydrogen-ion concentration, on the inoculation with root nodule bacteria and growth of soybeans, 'damping-off' of the seedlings was prevalent notwithstanding thorough sterilization of the seeds and the media. The term 'damping-off' in this investigation refers to the dropping over of the young plants and other conspicuous symptoms, such as browning and flaccidity of the stems, associated with the disease usually designated by that name. No observations were made on the infecting fungi or internal plant structure.

The seedlings were grown in a mixture of quartz sand and calcium clay (obtained by separating out the colloidal fraction from

Putnam silt loam, purifying it by electrodialysis, and adding varying quantities of calcium hydroxide). Other calcium compounds (acetate and chloride) were used for comparison. In a series of experiments it was found that damping-off decreased as acidity decreased and calcium increased. Further tests showed that the hydrogen-ion concentration in itself was of minor importance in relation to the damping-off, which occurred in a severe form between P_H 3·8 and 6·94 when the calcium supply was low but was absent when plenty of calcium was given. With an increasing calcium concentration the number of diseased plants declined rapidly both at P_H 7 and 4·4, while at a high calcium concentration no damping-off occurred between P_H 3·8 and 8. In another series of tests calcium ions were found to be superior to other mono- or divalent ions at equal concentrations. With potassium chloride the decrease in damping-off was from 94 to 74 per cent., with magnesium chloride from 96 to 12 per cent., and with calcium chloride (and also calcium acetate) from 89 to 0. The availability of the calcium is an important feature in its effect in controlling damping-off. Free, diffusible calcium ions were found to be more effective than adsorbed, exchangeable ones, while calcium bound by the forces of the crystal lattice in the mineral anorthite was ineffectual as a preventive.

SMALL (T.). **Prevention of blight in seed Potatoes.**—*Nature*, cxxx, 3279, p. 367, 1932.

Seed potatoes are usually dug in Jersey (Channel Islands) when the haulms are green. If blight (*Phytophthora infestans*) is present on the leaves at this time, serious losses (50 to 75 per cent.) may occur in the seed-boxes owing to the spores falling on the tubers. Experiments conducted at the States Experiment Station, Glenham, have shown that such losses may be almost entirely eliminated by dipping the 'seed' twice, soon after lifting, in a 1 per cent. dilution of formalin (1 pint in 99 pints of water) or in a neutral mixture of copper sulphate and caustic soda (4 : 1 : 40). There appears to be no reduction of sprouting as a result of this treatment.

Large-scale trials of this method are now in progress, the tubers being dug, placed in the seed-boxes, and dipped on the same day. Four men can unload, dip, and stack 360 boxes of 'seed' in one hour.

ADAM (D. B.). **Potato disease control : effects of seed treatment.**—*Journ. Dept. Agric. Victoria*, xxx, 9, pp. 455–461, 1 fig., 1932.

In recent experiments in the control of *Corticium vagum* [*C. solani*] on potatoes in Victoria, treatment with cold formalin solution (1 lb. to 30 galls. water) for 1½ hours resulted in an average increase of yield of 13 per cent., while a slightly smaller increase followed immersion in mercuric chloride (1 oz. to 6¼ galls.) for the same length of time. Preliminary tests with acidulated mercuric chloride (2 oz. to 6¼ galls. for 5 minutes) [*R.A.M.*, xi, p. 534] and germisan (2 oz. to 10 galls. for 15 minutes) gave results about equal to those obtained with the ordinary mercuric chloride treat-

ment. The acidulated mercuric chloride treatment is open to the objection of causing injury to the seed-potatoes under certain conditions. Formalin also may cause injury if used too strong on delicate seed stocks. The mercuric chloride solutions were found to be specially effective in reducing the incidence of 'collar rot' due to *C. solani*.

SALMON (E. S.). **Fifteenth report on the trial of new varieties of Hops.**—*Journ. Inst. of Brewing*, N.S., xxix, 10, pp. 464–469, 1932.

The following commercial hop varieties were infected by mosaic at the East Malling Research Station in 1931 [cf. *R.A.M.*, x, p. 127; xi, p. 745]: Canterbury, Petham, and Rodmersham Goldings, Mathon, Cobbs, Tutsham, Bramling, Extra Early Bird, and Old Jones (52 hills in all); and the following new ones: B12a, OF27, OR7, WI8, and OF76.

The observations on downy mildew [*Pseudoperonospora humuli*: ibid., xi, p. 471] are based on the records of F. H. Beard's periodical inspections of the gardens. The attack on the bines was fairly general, basal, terminal, and lateral spikes being very common. The first application of Bordeaux mixture (10–10–100) was given on 17th and 18th July, using about 400 galls. per acre. For the second (11th and 12th August) 250 galls. per acre were given. This treatment failed to protect the 'heads' of many of the bines, but the cones on the lower laterals remained quite free from infection. The crop of the OD99, OK27, and V46 varieties was so poor that it was not worth picking, while cone infection was severe on a number of other new varieties [a list of which is given].

HOERNER (G. R.). **Downy mildew infection of Hop seedlings.**—*Journ. Inst. of Brewing*, N.S., xxix, 10, pp. 470–471, 1932.

Both conidia and oospores of the hop downy mildew fungus (*Pseudoperonospora humuli*) were produced in abundance in and on the cotyledons and leaves of artificially inoculated hop seedlings of the Early and Late Clusters and Fuggles from Oregon, Late Clusters from California, East Kent Goldings from British Columbia, and Red Vines from Oregon [*R.A.M.*, xi, p. 602]. The inoculum was taken in part from the above-mentioned varieties and also from *Humulus lupulus* [var.] *neo-mexicanus*. The incubation period ranged from 1 to 14 days on the cotyledons and from 2 to 12 on the leaves. No positive indication of varietal resistance to the fungus was obtained. The fact that cross-inoculation was readily effected by the use of conidia from several different hosts appears to indicate that biologic forms of *P. humuli*, if they exist, are of rare occurrence.

RIVIER (A.). **Observations sur le Peronoplasmopara humuli.** [Observations on *Peronoplasmopara humuli*.]—*Rev. Path. Vég. et Ent. Agric.*, xix, 4, pp. 168–169, 1932.

This is a record of the discovery in June, 1932, of downy mildew (*Peronoplasmopara* [*Pseudoperonospora*] *humuli*) [see

preceding abstracts] on hops at the École d'Agriculture, Montpellier. The fact that the disease had not been previously found in the south of France, and that no new hop planting material had been brought to Montpellier since its appearance in northern France, would indicate that the infection was carried by wind from far afield.

SALMON (E. S.). & WARE (W. M.). **The small Hop disease.**—*Journ. South-Eastern Agric. Coll., Wye, Kent*, xxx, pp. 22–27, 4 pl., 1932.

After describing several further cases (affecting, as before, single plants in various hop-gardens) of small hop disease, the symptoms of which closely resembled those previously observed [*R.A.M.*, ix, p. 15], the authors state that although gall formations or cushions of tissue resembling tumours might be present in proximity to or actually bear the buds, they do not now consider that the condition is due to crown gall [*Bacterium tumefaciens*]. The groups of buds appear each to be formed by the proliferation of a single original bud or shoot on the crown or on the basal nodes of the previous season's bines.

WEBER (G. F.). **Blight of Peppers in Florida caused by Phytophthora capsici.**—*Phytopath.*, xxii, 9, pp. 775–780, 4 figs., 1932.

During the winter of 1930–1, two pepper [*Capsicum annuum*] varieties in the Homestead area of Florida were attacked by blight (*Phytophthora capsici*), the symptoms of which differed in certain respects from those described by Leonian from New Mexico [*R.A.M.*, ii, p. 101; xi, p. 803].

Infection occurred on the stems, branches, fruit, and leaves. Diseased stems were often girdled at soil level, resulting in a sudden wilting and death of the whole plant. The lesions consisted of dark green, water soaked bands, later turning brown. In young plants the tops were also invaded and killed. The spots on the leaves were at first small, circular or irregular, and scalded in appearance; later they enlarged, bleached to a pale tan colour, assumed a papery consistency, and sometimes fell out. The fruit was infected through the peduncle from stem lesions, and developed a dark green, water soaked aspect. The conidia were produced on short conidiophores growing through the epidermis in compact clumps. Infected pods rapidly shrivelled and remained attached to the plant in mummied form.

Abundant oospores but relatively few sporangia were developed in culture. A comparative study of this organism and *P. parasitica* revealed constant differences between the two. When uninjured pepper plants were inoculated with a water suspension of the sporangia of *P. capsici* in the greenhouse and field, 54 per cent. of infection was obtained under the former conditions and 19 per cent. under the latter. On other plants inoculated with agar overgrown by mycelium, 100 per cent. infection developed. Inoculations with *P. parasitica* failed to cause the typical symptoms. Similar results were given by inoculations on the pods.

Davis (R. L.). **Report of the Plant Breeder.**—*Rept. Porto Rico Agric. Exper. Stat., 1931*, pp. 13–22, 2 figs., 1932.

In breeding trials against sugar-cane mosaic carried out during 1931 in Porto Rico [cf. *R.A.M.*, x, p. 340; xi, p. 540] some 400 inbred seedlings of Kassoer U.S. 785 were obtained from Las Mesas in order to secure for breeding stock a prolific, high-sucrose, immune variety.

The crosses between P.O.J. 2725 and the inbred Kassoer seedlings, U.S. 785 and U.S. 541, gave several seedlings equal in sucrose content to first-year 'noble cane' seedlings. Seedlings from U.S. 541 pollinated with S.C. 12/4 were highly resistant. Several seedlings of P.O.J. 2725 and B.H. 10(12) also appeared to be resistant [ibid., ix, p. 132]. The outstanding progeny of the second-year seedlings was that of the cross between Mayaguez 28 and P.O.J. 2878; of 25 seedlings of this combination under trial, only one appeared to be very susceptible, the majority being resistant.

Notes made on the first ratoons of the mosaic-elimination plot of the P.O.J. 2364 and Mayaguez 9 seedlings confirmed the previous year's results, indicating that most of the 71 seedlings under trial are either highly resistant or immune.

The apparent immunity or so-called 'commercial resistance' (i.e., resistance high enough to render roguing inexpensive or unnecessary) of Mayaguez seedlings 3, 7, and 42 [P.O.J. 2725 × S.C. 12/4] is now well established; nos. 13, 52, and 83 are apparently immune. Mayaguez 28, 44, 49, 61, and 63 continued as in previous years to show only negligible amounts of mosaic, with the result that very little difficulty is anticipated in keeping the fields rogued. Preliminary field trials indicated that Mayaguez seedlings 7, 42, and 63 will compete successfully with B.H. 10(12) in sugar production. The area planted with Mayaguez seedlings increased from 73 acres in 1930 to over 600 in 1931.

Davis (R. L.). **Mayaguez 28, 49, and 63, three Sugar Cane varieties commercially resistant to mosaic.**—*Agric. Notes, Porto Rico Agric. Exper. Stat., Mayaguez*, 61, 6 pp., 1932. [Mimeographed.]

In this progress report of breeding work against sugar-cane mosaic in Porto Rico [see preceding abstract] carried out during 1931 and 1932, full details are given of the characters of the Mayaguez seedlings 3, 7, 28, 42, 49, and 63, and of the trials that were made with them. The most promising seedlings appeared to be Mayaguez 28, 63, and 42 (in descending order of merit). Mayaguez 28, 49, and 7 are recommended for either upland or non-irrigated lowland trials and Mayaguez 28, 3, 42, and 63 for irrigated lowland. Of all these varieties, Mayaguez 28 appears to be the most adaptable, having given satisfactory results on sandy alluvial lowland and on dry hillsides.

Martin (J. P.). **Field control of mosaic disease in Hawaii.**—*Proc. Fourth Congr. Internat. Soc. Sugar Cane Technologists*, 1932. [Abs. in *Facts about Sugar*, xxvii, 8, p. 365, 1932.]

Mosaic of sugar-cane in Hawaii is stated to be now serious only

in a few localized areas and on a small number of highly susceptible varieties [*R.A.M.*, xi, p. 539]. In the field rigid selection of healthy cuttings for seed is practised, so that newly planted fields may be kept almost free from the disease. Cane knives are known to transmit the virus and require frequent disinfection. The most efficacious of all control measures is the replacement of susceptible (e.g., Striped Tip) by resistant varieties, such as D. 1135. Other important means of combating mosaic include systematic roguing and clean cultivation, the latter involving the exclusion from the plantations of any hosts of the maize aphid [*Aphis maidis*].

Bell (A. F.) & Cottrell-Dormer (W.). **Method for isolating the leaf scald organism.**—*Proc. Fourth Congr. Internat. Soc. Sugar Cane Technologists*, 1932. [Abs. in *Facts about Sugar*, xxvii, 8, p. 365, 1932.]

The isolation of *Phytomonas* [*Bacterium*] *albilineans*, the causal organism of leaf scald of sugar-cane [*R.A.M.*, xi, pp. 403, 539, 604], is difficult on account of its slow rate of growth and the necessity for heavy sowing. The writers have found that the organism thrives better in a medium in which it has already grown than in a fresh portion of the same medium. The bacterium is accordingly sown in a large quantity of Wilbrink's agar, and after sufficient growth has been made the entire batch is pasteurized and then used as a medium for investigating the lesions of plants suspected of leaf scald. The preparation and maintenance of large quantities of the agar present certain inconveniences which may be overcome by incorporating 0·005 per cent. sodium sulphite with the ordinary Wilbrink's medium.

Abbott (E. V.). **Cytospora sacchari on Sugarcane in Louisiana.** —*Plant Disease Reporter*, xv, 14, p. 160, 1931. [Mimeographed. Received December, 1932.]

Cytospora sacchari [*R.A.M.*, ix, p. 808] was of fairly common occurrence on sugar-cane in Louisiana during 1931, the fungus having been collected in the autumn of 1930, apparently for the first time in the United States, on the Co. 281 variety. It is stated to be of little or no economic importance.

Cook (M. T.). **Thielaviopsis paradoxa an important disease of Sugar Cane. Marasmius sacchari a parasite on Sugar Cane.** —*Journ. Dept. Agric. Puerto Rico*, xvi, 2, pp. 205–226, 5 pl., 1932.

The writer's observations on the importance of *Thielaviopsis* [*Ceratostomella*] *paradoxa* as a cause of poor germination of seed cane in Porto Rico have already been summarized from another source [*R.A.M.*, xi, p. 542]. Attention is here drawn to the variable extent of the losses in different years, depending on local conditions.

Of recent years plants have frequently been observed making poor growth, the lower leaves being dead and bound together and to the base of the plant by a white mycelial weft extending both above and below soil level. Sometimes the young canes were killed and the roots were generally in bad condition. The fungus,

Marasmius sacchari [ibid., xi, p. 674], was readily isolated from diseased plants and grew well in culture. Sterile pieces of cane 2 in. long bearing one bud were grown in glass cylinders and inoculated with the fungus grown on sterilized cane plugs. The organism attacked any part of the shoot with which it came into contact, penetrating and completely covering the smaller ones and preventing the buds from sprouting. Young shoots were more rapidly destroyed than older ones. Young plants grown in sterilized soil and inoculated by pushing infected cane plugs down into the soil beside them, were dwarfed but not killed. A mass of mycelium was also formed over the surface of the leaves and between them. The fungus was detected in all the cells of young plants except those with very thick, hard walls such as are found in the vascular bundles, while even the latter may be penetrated when the inoculated plugs are placed in contact with the tip of the young cane. In infected roots the mycelium was found from the centre of the pith to the epidermis.

It is evident from these results that *M. sacchari* is a vigorous parasite of growing canes. The decay due to this organism, however, is slower than that caused by *C. paradoxa*.

SHEPHERD (E. F. S.). **A preliminary list of plant diseases occurring in Mauritius.**—*Mauritius Dept. of Agric. Bull.* 18, Sci. Ser., 8 pp., 1932.

An annotated list, arranged in alphabetical order of hosts, is given of the bacterial, fungous, virus, and physiological diseases affecting fruit, vegetables, sugar-cane, tea, tobacco, grasses, and ornamental and miscellaneous plants in Mauritius.

MENDOZA (J. M.). **New or noteworthy Philippine fungi. II.**—*Philipp. Journ. of Sci.*, xlix, 2, pp. 185–196, 9 pl., 1932.

Continuing his studies on the sooty moulds of the Philippines [*R.A.M.*, xi, p. 547], the writer describes (with Latin diagnoses) four new species of *Asterina*, and one each of *Asterinella*, *Asteromyxa*, *Aithaloderma*, and *Chaetothyrium*. *Aithaloderma fici* n. sp., found forming a sooty mould on *Ficus* leaves in Luzon, Batangas Province, and elsewhere, resembles *A. setosum* [ibid., x, p. 559] in many respects but differs from the latter in its stout sagittate setae. *C. muriformis* n. sp. forms a sooty mould on the leaves of *Codiaeum variegatum* in various localities.

MARTIN (G. W.). **Systematic position of the slime molds and its bearing on the classification of the fungi.**—*Bot. Gaz.*, xciii, 4, pp. 421–435, 1932.

The origin and development of the Myxomycetes or slime moulds is discussed in the light of modern research as well as in that of the older interpretations, and the differences between this group and the Phycomycetes are critically examined. In the writer's view, these differences are neither so absolute nor so fundamental as to necessitate a greater separation than may be admitted between two classes of the same phylum. It is suggested that the fungi be regarded as a monophyletic group, but one which has not definitely developed into either plants or animals, though

it may be classified with the former for the sake of convenience and in accordance with custom. The Myxomycetes would then form a natural class, the lowest of four, the others being the Basidiomycetes, Ascomycetes, and Phycomycetes.

HUMPHREY (C. J.) & LEUS-PALO (SIMEONA). **Studies and illustrations in the Polyporaceae, III. Supplementary notes on the Ganoderma applanatum group.**—*Philipp. Journ. of Sci.*, xlix, 2, pp. 159–184, 11 pl., 1932.

Since their preliminary revision of the *Ganoderma applanatum* group of the Polyporaceae [*R.A.M.*, xi, p. 10], the authors have examined several of the older types of this group from the Kew Herbarium and the Paris Museum. The results of these studies have confirmed the opinions previously advanced as to the taxonomy of the organisms represented.

In view of the different interpretations given to *G. australe* [ibid., vii, p. 406], and the lack of satisfactory authentic material for comparative purposes, it is considered advisable to discontinue the use of this name. *G. tornatum* and *G. testaceum* are regarded as varieties of *G. applanatum*, and *G. subtornatum* as a form of *G. mastoporum*.

PALM (B. T.). **On Cyttaria Berk. and Cyttariella n. gen.**—*Ann. Mycol.*, xxx, 5–6, pp. 405–420, 4 figs., 1932.

Taxonomic notes, supplemented by a key, are given on four species of *Cyttaria*, namely, *C. darwini*, *C. harioti*, *C. hookeri*, and *C. intermedia* n. sp., all on *Nothofagus* sp., collected in part by Dr. C. Skottsberg in Tierra del Fuego during 1901–03 and supplemented by material supplied by Dr. O. Borge from southern Patagonia.

A small, *Cyttaria*-like pycnidial fungus growing as a parasite on the younger twigs of *N. betuloides* in Tierra del Fuego is named *Cyttariella skottsbergii* n.g., n. sp., with Latin diagnoses. The piriform or clavariiform, erumpent stromata are yellow or dark externally and white within; the pycnidia occur in the flattened top of the stroma, from which the numerous (10 to 25) minute ostioles protrude, and are 200 to 300 μ in diameter. The interior of the pycnidium is uniformly lined with short, blunt, hyaline sterigmata up to 20 μ long, bearing hyaline conidia, 4 by 2 μ in diameter. *C. skottsbergii* differs from *C. deformans* (Bomm. & Rouss.) comb. nov. (*Podocrea deformans* Bomm. & Rouss.) chiefly in the pycnidia being found all over the stroma in the latter, as well as in the size and colour of the stromata. The mycelium of *C. skottsbergii* forms ligneous tumours on the twigs of its host, in which the woody and cortical elements are hypertrophied. In this it resembles the description of *C. deformans* given by Bommer and Rousseau.

DONANDT (S.). **Untersuchungen über die Pathogenität des Wirtelpilzes Verticillium alboatrum R. u. B.** [Investigations on the pathogenicity of the whorl fungus *Verticillium alboatrum* R. & B.]—*Zeitschr. für Parasitenkunde*, iv, 4, pp. 653–711, 4 figs., 5 graphs, 1932.

An exhaustive account (preceded by a discussion of the more

the cultural measures calculated to prevent it. For direct control the local growers are recommended to spray the tomato plants with colloidal sulphur, keeping in view the fact that timely application is more important than the strength of the spray. If the disease appears early in the season, fortnightly applications are advised, but later on the intervals may be extended to three weeks. The glasshouses should be thoroughly disinfected before the new crop is planted, preferably by fumigating them with formaldehyde or sulphur dioxide.

RUPPRECHT (G.). **Schwefelnebel gegen die Braunfleckenkrankheit der Tomaten.** [Sulphur mist against the leaf mould disease of Tomatoes.]—*Obst- und Gemüsebau*, lxxviii, 10, p. 160, 1932.

The writer's experience agrees with that of Small as regards the failure of sulphur fumigation in the control of tomato leaf mould (*Cladosporium fulvum*) once the disease is established [*R.A.M.*, xi, p. 211], but by the use of the new sulfurator apparatus [ibid., xi, p. 254] the development of the fungus may be prevented. It is pointed out that the temperature of the greenhouse to be fumigated should not exceed 40° C., above which point the fungicidal pentathionic acid generated by the sulphur in sunlight at 25° and over [ibid., xi, p. 465] is liable to burn the plants. The sulfurator has also given good results in the prevention of apple mildew [*Podosphaera leucotricha*] in the Hamburg district.

FINLAYSON (E. H.). **Report of the Director of Forestry 1930–31 (fiscal year ended March 31, 1931).**—*Dept. of the Interior, Canada*, Ottawa, F. A. Acland, 19 pp., 1932.

This report contains, *inter alia*, the following items of phytopathological interest. The *Septoria* canker of poplars [*R.A.M.*, xi, p. 137] has been found to occur with equal severity on trees of Russian, Northwest, and Saskatchewan origin. The fungus enters the stem through wounds but cannot penetrate healthy bark; its incubation period is seven weeks.

In order to prevent fungous rots, wooden poles were placed in tin containers filled with preservative salts, e.g., zinc chloride and copper sulphate. The salts are dissolved by moisture trickling down the poles, and during dry weather the evaporation of moisture from the upper part draws the solution upwards until the pole is impregnated to within a few inches of the top. After a few years' service, however, the parts of the pole just above and below ground level require a brush treatment with creosote [ibid., xii, p. 1].

Tests of red-stained jack pine [*Pinus banksiana*] showed that of the two fungi causing this defect, viz., *Trametes pini* and an unnamed organism, the former may reduce the strength values by up to 75 per cent. while the corresponding loss due to the latter is under 10 per cent.

Torula ligniperda [ibid., xi, p. 137] was found to be producing 'red heart' in birch.

HARRIS (H. A.). **Initial studies of American Elm diseases in Illinois.**—*Bull. Illinois Dept. Registr. & Educ., Div. Nat. Hist. Survey*, xx, Art. 1, 70 pp., 32 figs., 3 diags., 1932.

Elm trees in Illinois have long been affected by a number of pathological conditions, collectively known as 'wilt', of which the general symptoms are the presence of dead limbs, usually near the top; blighting of the twigs on one or more branches; and wilting of the leaves. On closer inspection cankers of widely varying appearance and dimensions may be found on the diseased limbs. Affected trees frequently retain their dead foliage for some time after normal leaf abscission. Elm 'wilt' is stated to have caused very heavy losses among nursery trees since its detection in 1925.

From some 200 specimens of diseased material the writer made 512 isolations yielding 20 genera of fungi, chiefly *Alternaria* (23·44 per cent. of the total number) and *Coniothyrium* (16·21), the latter being the outstanding cause of destructive wilting while *Alternaria* is a chance inhabitant of the bark, not producing serious disease. The *Coniothyrium* apparently enters the trees through the young, growing shoots at the tips of the branches, as the leaves are unfolding. Those nearest the site of invasion turn yellow and shrivel, and as infection progresses downwards, more leaves are killed and the tips curl in the shape of a shepherd's crook. The leaves of diseased trees are few, and small. Sunken, water soaked, reddish- to greyish-brown or dark purple cankers appear on the infected branches, completely girdling the young shoots and twigs. The wood of diseased stems shows a marked light to darkish brown, diffuse discoloration. The cortical and phloem tissues are extensively disorganized by the inter- and intracellular mycelium, the cambium is destroyed, and tracheomycosis develops in the xylem. Gummosis is a common symptom of *Coniothyrium* infection, which usually kills the trees within two or three years. Two types of the fungus, *A* and *B*, distinct in morphological and cultural characters, were isolated from diseased material. The former is characterized by spherical to subglobose, dark brown pycnidia, 95 to 350 μ in diameter in nature and up to 476 μ in agar cultures, producing unicellular, olivaceous, oval or spherical to oblong pycnospores, 3·6 to 7·3 by 2·9 to 5·8 μ (mostly 5·1 to 5·8 by 3·6 to 5·1 μ). The pycnidia of *B* are dark brown, spherical, 60 to 272 μ in diameter, and produce subhyaline to brown, unicellular, ovoid-oblong to short elliptical pycnospores, 2·5 to 6·6 by 1·4 to 4·4 μ (mostly 3·6 to 4·4 by 1·4 to 2·2 μ). Both forms differ from *C. ulmi*, a parasite of *Ulmus campestris* in America, and the *B* type is thought to be probably distinct also from *C. fuckelii* [*Leptosphaeria coniothyrium*], though *A* somewhat resembles the latter.

A species of *Vermicularia* obtained from 1·36 per cent. of the total number of isolations, causes extensive defoliation and destruction, without cankers, of the branches of mature shade trees, accompanied by a dark brown, streaky internal discoloration of the wood. It is characterized by dark brown, globose, setose pycnidia, 40 to 122 μ in diameter (average 80 to 95 μ), and hyaline, unicellular, oblong, short elliptical, or bacilliform pycnospores, 1·8 to 3·6 by 0·7 to 1·4 μ (mostly 2·2 to 2·9 by 1·4 μ).

The length of time (4 to 10 days, mostly 6) between inoculation and the appearance of the first systemic symptom, viz., clearing of the veins, was found to be dependent on the number of primary lesions, which ranged from one to over 100 according to the method of inoculation. In old plants, the movement of virus to the top took place earlier when all the expanded leaves except the one inoculated were removed than when all were allowed to remain on the plant. Tissues towards the base of a leaf appeared to be more readily infected by pin puncture inoculation, and more capable of permitting early movement of virus from the leaf than those near the apex. The first indications of vein clearing commonly developed near noon, more rarely during the late afternoon, night, or early morning.

A great many unilateral infections were caused by shading the inoculated leaf in each plant, the results indicating that the distribution of the virus to the top of the plant can be modified by shading appropriate portions of leaf surface in the lower part of the plant. It is suggested that shading reduced the food supply to the growing parts from the inoculated leaf and the results might be explained by assuming that the virus travelled with the food supply.

The movement of the virus to the top of the plant was slightly delayed by cutting through the large veins between the site of inoculation and the petiole, and, when the large veins were thus prevented from conducting the virus, evidence was obtained that the latter was transported along the smaller veins to reach uncut large ones. Except in such experiments no extensive invasion of the small veins took place. When interveinal tissues alone were cut there was much less delay in the passage of the virus. Rapidity of movement of the virus was correlated with rapidity of growth of the inoculated leaf.

HOLMES (F. O.). **Symptoms of Tobacco mosaic disease.**—*Contrib. Boyce Thompson Inst.*, iv, 3, pp. 323–357, 8 figs., 1 graph, 1932.

A description is given of some variations of the usual symptoms of common tobacco mosaic (Johnson's virus 1) [see preceding abstract], and of other effects hitherto overlooked, such as prolonged yellowing, occurring in *Nicotiana quadrivalvis*, *N. multivalvis*, *N. clevelandii*, and certain chilli pepper varieties; leaf abscission in *Physalis peruviana* and some chilli varieties; flower and fruit drop in chilli and *N. quadrivalvis*; outgrowths of tissue ['enations'] on the lower side of mottled leaves in *N. tomentosa* and *N. paniculata* [*R.A.M.*, xii, p. 58]; systemic necrosis in young plants of *N. rustica*, *P. angulata*, Black Beauty eggplant, Green Mountain potato, and chilli; failure to remove chlorophyll from the secondary lesions on old leaves of *Nicandra physaloides*, *Lycium ferocissimum*, and chilli; bending of the upper stem towards the side of the plant bearing an inoculated leaf in *Nicotiana rustica*; and intensification of pigment in the spots on flowers of *Nicandra physaloides*.

Certain hosts of tobacco mosaic belong to the group of completely or almost completely symptomless carriers, e.g., the

Hangchow Long eggplant, *P. alkekengi*, *Nicotiana glauca*, and the red currant tomato (*Lycopersicum pimpinellifolium*), in which an increase of virus occurs in the inoculated organs without any corresponding external effect. The inoculation of *Petunia* varieties and *Martynia louisiana* with tobacco mosaic causes a reaction resembling that of Turkish tobacco, *Nicotiana sylvestris*, *N. longiflora*, *N. rusbyi*, *N. suaveolens*, and *N. palmeri* (pronounced mottling and foliar distortion). *N. trigonophylla*, tomato, and *Solanum nigrum* are similarly but less severely affected, while the Long White and Peking Green eggplant develop an obscure mottling which may almost disappear and leave the plants as symptomless carriers. *Hyoscyamus niger* becomes severely stunted and yellowed after clearing of the veins. Localized necrosis of various types occurs in *N. glutinosa*, *N. alata*, *N. sanderae*, *N. acuminata*, *N. langsdorffii*, *Datura stramonium*, Black Beauty eggplant, and beans (*Phaseolus vulgaris*) [ibid., ix, p. 810] inoculated with this virus.

The enations developing as a result of inoculation on *N. tomentosa* and *N. paniculata* occur on the lower surface in areas that fail to expand normally, and may be a quarter of an inch or more in height. They have not been seen on healthy plants but appear sooner or later on all the inoculated ones.

PRICE (W. C.). **Acquired immunity to ring-spot in Nicotiana.**—*Contrib. Boyce Thompson Inst.*, iv, 3, pp. 359–403, 7 figs., 2 graphs, 1932.

The symptoms of ring spot (obtained from Wingard) in Turkish tobacco [*R.A.M.*, xi, p. 406] were found in the writer's experiments to vary with the environmental conditions. Inoculated plants kept in darkness develop water soaked, necrotic spots, and eventually succumb to the disease. Those grown under humid conditions develop lesions consisting of many more concentric rings than when the plants are kept dry.

More or less complete recovery from ring spot occurred in all the plants tested of *Nicotiana langsdorffii*, *N. sylvestris*, *N. multivalvis*, *N. quadrivalvis*, and the following varieties of *N. tabacum*: Turkish, Burley, Little Orinoca, *auriculata*, *purpurea*, *angustifolia*, *calycina*, *colossea*, *gigantea*, and *macrophylla*. The juice from all the recovered plants tested was found to be still highly infectious and produced similar symptoms in healthy tobacco plants to those given by inoculation with the virus from severely diseased individuals. No symptoms developed on recovered plants as a result of further inoculation with the ring spot virus, which suggests that immunity can be acquired as a result of infection. In experiments in which the stem tips were kept defoliated until the virus had reached the young tip bud, the plants thus treated acquired immunity from ring spot without ever showing symptoms of the disease. It was found that immunity in Turkish tobacco persisted for three generations in plants grown from cuttings but was not transmitted through the seed to any of the 825 seedlings tested. Grafting experiments gave no evidence that acquired immunity in Turkish tobacco is accompanied by the production of antibodies.

Some plants that fail to make a complete recovery show mild symptoms readily distinguishable from those of the early stage of acute infection. They consist merely of mild chlorotic or necrotic symptoms on the margins and tips of a few leaves, sometimes extending irregularly into the midrib.

Inoculation experiments with the ring spot virus gave positive results on a number of bean (*Phaseolus vulgaris*) varieties, Lima and var. *sieva* of *P. lunatus*; three varieties of *P. lunatus* var. *macrocarpus*; and four of cowpeas. Systemic symptoms in the form of circular, necrotic spots on the young leaves and irregular, reddish lesions on the stems and leaf petioles, developed on some of the bean and cowpea varieties and eventually caused the death of the plants.

Stevens (N. E.) & Nance (Nellie W.). **Spoilage of Tomatoes in transit, as shown by inspection certificates, 1922 to 1930.**—*U.S. Dept. of Agric. Circ.* 245, 4 pp., 1932.

A summary is given, based on an analysis of the data obtained in regular carload inspections, of the principal diseases affecting tomatoes in transit from California, Florida, Mississippi, Tennessee, Texas, and Mexico. These include *Rhizopus nigricans*, *Phoma destructiva* [*R.A.M.*, xii, p. 24], *Bacillus carotovorus*, *B. aroideae*, and other agents of soft rot, *Corticium vagum* [*C. solani*], blossom-end rot, buckeye (*Phytophthora terrestris*) [*P. parasitica*], *Colletotrichum phomoides* [ibid., x, p. 439], *Fusarium lycopersici*, late blight (*P. infestans*), and nailhead (*Macrosporium*) [*Alternaria tomato*: ibid., xi, p. 771]. The total incidence of decay in the 3,132 carloads inspected from 1923 to 1926 was 10 per cent., the corresponding figures for 1927 to 1930 being 8 per cent. in 5,321 carloads.

Wardlaw (C. W.) & McGuire (L. P.). **The storage of tropically-grown Tomatoes.**—*Empire Marketing Board Publ.* 59, 50 pp., 9 graphs, 1932.

Investigations conducted at the Low Temperature Station, Trinidad, into the cold storage of tropically grown tomatoes showed that nearly all the active fungal wastage that occurred was sustained after the fruit had been removed from cold storage to the ripening room at 70° F. Except for the occasional presence of soft rot (*Bacterium* [*Bacillus*] *aroideae*) [*R.A.M.*, x, p. 610] few infections developed on selected fruit stored at 45°, 47·5°, or 50°. In one lot of rejected fruit the decay was due chiefly to soft rots associated with species of *Phomopsis* and *Fusarium*, but in two other lots in later trials the rejections were due chiefly to the spotting caused by *Phoma destructiva* [see preceding abstract]. *Alternaria solani* was usually present on infections where the skin showed a dark, leathery discoloration, while *Glomerella cingulata* was associated with a soft rot. Spotting and soft rots (the main sources of wastage) occurred either in conjunction with cracks and bruises, or at the insertion of the style or the button, or as isolated infections distributed over the surface of the fruit. The proportion of button to other infections was usually high, especially after

long storage (14 to 17 days) and when the fruit was kept at the higher temperatures.

At temperatures below 47·5° the characteristic tomato pathogens showed greatly retarded growth or none. As this temperature does not unduly delay maturation it is a suitable one for the storage of Trinidad-grown tomatoes.

HORSFALL (J. G.). **Dusting Tomato seed with copper sulfate monohydrate for combating damping-off.**—*New York (Geneva) Agric. Exper. Stat. Tech. Bull.* 198, 34 pp., 3 figs., 4 graphs, 1932.

This is a detailed account of experiments in 1930–31 on the efficacy of seed disinfection with copper compounds in the control of tomato seedling damping-off caused by *Pythium ultimum* [*R.A.M.*, xi, p. 408]. The results (which were also subjected to statistical tests) showed that dusting the seed with monohydrated copper sulphate was more effective than either copper carbonate dust or steeping the seed in copper sulphate solution in protecting the seedlings against attacks by the fungus before their emergence; after their emergence, however, the incidence of the disease was least on those raised from seed steeped in copper sulphate, next in those raised from seed dusted with monohydrated copper sulphate, and highest in the copper carbonate lot. Dilution of the monohydrated copper sulphate with three volumes of kaolin did not appear to reduce its efficacy. Anhydrous copper sulphate dust was equally efficient, and adhered somewhat better to the seed, but is not recommended for general practice because of its higher cost. It was shown that 1 lb. of tomato seed thoroughly dusted with monohydrated copper sulphate retains 0·6 oz. of the dust.

The experiments also established that none of the copper compounds tested is toxic to the tomato seedlings, and that steeping the seed for as long as two hours in a saturated solution of copper sulphate not only did not reduce the stand of the seedlings but stimulated their growth and vigour in infected soil; in steamed soil, however, this treatment retarded the emergence of the seedlings by two days on the average, and had a slightly depressing effect on their health.

In a theoretical discussion of the phenomena involved in the attack on the host roots by soil-borne organisms, the author suggests the term 'inoculum potential' to describe the effect of the content of the soil in infective material on the severity of infection, independently of the environmental factors. A brief description is included of a relatively inexpensive autoclave for experimental soil sterilization.

CHAMBERLAIN (E. E.). **Tomato leaf-mould (Cladosporium fulvum).**—*New Zealand Journ. of Agric.*, xlv, 3, pp. 136–142, 2 figs., 1932.

After a brief account of the life-history of the tomato leaf mould fungus (*Cladosporium fulvum*) [*R.A.M.*, xi, p. 679], the author states that it is one of the most troublesome diseases of the crop under glass in New Zealand, and gives an outline of the conditions that favour its appearance and development, as well as of

important relevant literature) is given of the writer's cross-inoculation experiments with *Verticillium albo-atrum* isolated from tomato, *Chrysanthemum morifolium*, eggplant (U.S.A.), *Papaver bracteatum*, lime (*Tilia parvifolia*), *Acer negundo*, elm (*Ulmus montana*), cherry, red currant, gooseberry, horse-chestnut, and plum, and with *V. albo-atrum* var. *caespitosum* [*R.A.M.*, ix, p. 6] from Frühe Rosen potato and var. *medium* [loc. cit.] from imported banana leaves. Except where otherwise stated, all the isolations were from German material. The following additional hosts were used in the inoculation experiments: elm (*U. campestris*), cherry (*Prunus mahaleb*), pepper (*Capsicum annuum*), *Physalis alkekengi*, and cotton (*Gossypium herbaceum*).

No indication of biologic specialization was afforded by these tests, the outcome of which showed that all the strains are capable of infecting each of the hosts (with the possible exception of elm), though with varying degrees of virulence. The most virulent strains for the herbaceous plants were those from potato, tomato, eggplant, and banana in the order named, while the woody plants were most severely infected by the currant and horse-chestnut isolations. From the very low incidence of infection produced on the elm it seems probable that this tree would ordinarily remain immune. Bewley's observation as to the inherent superiority of sclerotial over asclerotial strains of *V. albo-atrum* from the pathogenic standpoint [ibid., ii, p. 150] could not be confirmed by these tests.

A study of the influence of nutrition on the host and its consequent reactions to the fungus showed that in plants receiving insufficient nitrogen the parasite is restricted to the stem bases. With a moderate nitrogen supply penetration of the tops may be effected, but typical symptoms of infection are not apparent. Plentiful applications of nitrogen, on the other hand, lead to vascular obstruction, wilting, yellowing, and premature decay.

CASTELLANI (A.). **A new variety of Geotrichum matalense (Geotrichum matalense var. chapmani.)**—*Journ. Trop. Med. & Hygiene*, xxxv, 18, pp. 278–279, 3 figs., 1932.

An investigation of the fungus found by A. Chaston Chapman obstructing a London sewer in 1928 [*R.A.M.*, ix, p. 274] showed that it is very similar to *Geotrichum* (*Oidium*) *matalense*, encountered by the author in Ceylon in 1914.

The sewer organism, which is named *G. matalense* var. *chapmani*, is characterized by numerous septate hyphae, 1 to 4 μ in width, and by oblong or spherical, thick-walled arthrospores, 7 to 9 μ in length as compared with 4 to 7 μ for *G. matalense*. The biochemical characters of both fungi are practically identical, glucose, levulose, glycerol, arabinose, and xylose being fermented and litmus milk turned alkaline.

VALLEAU (W. D.) & JOHNSON (E. M.). **Tobacco diseases in Kentucky.**—*Kentucky Agric. Exper. Stat. Bull.* 328, pp. 109-154, 24 figs., 1932.

In this bulletin, which is stated to be the outcome of ten years' study at the Kentucky Experiment Station, brief and well-

illustrated accounts are given of the chief physiological, parasitic, and virus diseases of tobacco in the field, and of the trouble in the curing house locally known as houseburn, which is stated to be caused by the activity of fungi and bacteria in over-moist conditions at temperatures between 60° and 100° F. This is preceded by brief recommendations for the control of the diseases, applicable to Kentucky conditions. Most of the information given has already been noticed from time to time in this *Review*.

THUNG (T. H.). **Phytopathologische waarnemingen.** [Phytopathological observations.]—*ex* Jaarverslag 1 Mei 1931–30 April 1932.—*Proefstat. Vorstenlandsche Tabak, Meded.* 76, pp. 30–51, 3 figs., 1 diag., 1932.

A new form of tobacco mosaic (first observed in 1929) developed on two plantations in the Vorstenland, Java, during the period under review and caused heavy damage. The diseased plants had very small and irregularly shaped leaves and produced scarcely any that could be harvested. The sap of plants suffering from this type of mosaic appears to be much less virulent than that of the ordinary form, and it is probable, therefore, that infection spreads from plant to plant in the seed-bed instead of being transmitted in the usual way by coolies during the handling of the plants some two months after transplanting.

A reduction of yield due to *Phytophthora* [*parasitica nicotianae*: *R.A.M.*, xi, p. 750] was observed in tobacco plots following katjang tjina [groundnut] but not after rice. Slime disease [*Bacterium solanacearum*] was not detected, but it is pointed out that this organism can lead to a diminished crop without producing any external symptoms. During 1928–9 slime disease occurred in a very severe form in another plantation following groundnuts, and in 1931 it was still present though less extensive.

Mildew (*Oidium tabaci*) [*Erysiphe cichoracearum*: ibid., xi, p. 333] was little in evidence, probably because the tobacco crop was planted late and the rains washed away the spores of the fungus before they could be disseminated. An increase in the amount of sulphur ordinarily used for strewing the ground against this disease was found to impair the quality and burning capacity of the tobacco.

On some estates it was necessary to harvest early in order to avoid the white spotting and shot hole of the leaves caused by *Cercospora nicotianae* [ibid., xi, p. 477], which was further responsible for much damage in the curing barns. The incidence of infection was considerably reduced in the seed-beds by regular applications of Bordeaux mixture at 5-day intervals, the average number of spots in each of three treated beds containing 900 seedlings being 337 compared with 4,895 in the controls.

HOLMES (F. O.). **Movement of mosaic virus from primary lesions in Nicotiana tabacum L.**—*Contrib. Boyce Thompson Inst.*, iv, 3, pp. 297–322, 2 figs., 4 graphs, 1932.

Full details are given of the author's study of the movement of the tobacco mosaic virus from inoculated leaves of a Turkish variety, using the iodine method of detection [*R.A.M.*, xi, p. 333].

Two distinct cultural strains of *Phoma* (*A* and *B*) were found to cause thickened, raised, smooth cankers and a diffuse discoloration of the cortex and wood (3·71 per cent. of the total isolations), the colonies of the former on maize meal agar being dendritic with a dark brown mycelium and tufted, greyish hyphae, while those of *B* are concentrically zonate with a pale olivaceous to yellowish-brown mycelium. Both strains possess flask-shaped to globose pycnidia, 120 to 275 μ in diameter (average 135 to 150 μ), and hyaline, unicellular, bacilliform, biguttulate pycnospores, 1·8 to 4·4 by 1·1 to 4 μ (mostly 2·9 by 1·4 to 1·8 μ). A third type was isolated from four trees, in conjunction with an *Alternaria* and appears to resemble *P. alternariaceum* [*P. conidiogena*] [*R.A.M.*, vi, p. 241; xi, p. 374].

Trees attacked by *Sphaeropsis* [or *Botryodiplodia*] *ulmicola* [ibid., xi, p. 212], which occurred in 2·15 per cent. of the isolations, assume a stag-headed appearance due to the early death of the top branches, below which secondary shoots are often formed, giving a witches' broom effect. Reddish-brown to brownish-black cankers develop on the stem and the discoloration extends to the underlying cambial area and wood. The scattered, erumpent pycnidia are 200 to 300 μ in diameter, and the ellipsoid to obovate, yellowish-brown conidia, 20 to 30 by 12 to 15 μ.

The canker-forming *Phomopsis* [cf. next abstract] observed in a few cases produces both the oval α and the slender, curved β spores [ibid., x, p. 279], and agrees fairly well with that found in Holland [ibid., viii, p. 206; ix, p. 5; cf. also xi, p. 212]. The α spores of the Illinois species measure 5·8 to 11·7 by 1·8 to 3·3 μ (mostly 7·3 to 8·8 by 2·2 to 2·5 μ) and the β 23·2 by 1 μ.

Notes are also given on the following organisms associated with elm wilt: *Verticillium albo-atrum* [ibid., x, p. 633 and above, p. 116], *Fusarium scirpi* var. *compactum*, *F. oxysporum*, *Cephalosporium* spp. *Anthostomella* sp., *Cytospora* (?) *ambiens*, *Diplodia ulmi* (Dearness's diagnosis of which is amended as regards spore dimensions), *Nigrospora sphaerica* [ibid., vi, p. 758 *et passim*] and several other, possibly saprophytic forms.

RICHMOND (B. G.). **A Diaporthe canker of American Elm.**—*Science*, N.S., lxxv, 1934, pp. 110–111, 1932.

American elms [*Ulmus americana*] in eastern Massachusetts have been affected of recent years by a canker causing hypertrophy and partial or total girdling of the branches. The lesions are slightly depressed, roughened, and cracked along the margin, the surface being covered with small pustules. In one case a canker was observed to extend through several nodes of a branch, and to be sharply delimited by a raised cork layer. Branching out from this diseased area was a young twig that had been killed back, the new growth being stunted and the leaves turning brown and dry before reaching maturity.

The pycnidia of the species of *Diaporthe* (*Phomopsis*) [see preceding abstract] associated with this disease are solitary, black, smooth, carbonaceous, ostiolate with short necks, conical or elliptical. The α pycnospores are borne on subulate or clavate, persistent stalks measuring about 11·2 to 15·2 by 2·8 to 5·2 μ, and are

hyaline, biguttulate, ovoid or elliptical with subacute or narrow pointed ends. They vary from 6·5 to 8·8 by 2·7 to 4 μ. The β spores, on similar stalks, are cylindrical, hyaline, unicellular, usually hamate and tapering to a point at the curved end, and measure 22·7 to 27·5 by 0·98 to 1·3 μ. Perithecia were obtained in cultures on sterilized twigs and malt agar. They are single or clustered, separately erumpent, membranous, leathery, globose, 400 by 385 μ, and usually situated in darkened, effuse stromatic areas, beneath which lines develop in the wood. The elongated, slender beaks project about 5 mm. above the surface of the twig. The cylindrical, clavate asci measure about 33 to 50 by 5·1 to 6·9 μ. Long, slender, sinuous, continuous, simple paraphyses are usually present. The uni- or biseriate, bicellular, hyaline, quadriguttulate ascospores measure 10·9 to 12·3 by 3·8 to 4·5 μ.

The fungus was compared with *D. protracta*, *D. perjuncta*, *D. discutiens*, *D. malbranchei*, and *D. eres* and found to correspond most closely with the last-named. Of the seven species of *Phomopsis* compared with the elm organism *P. oblonga* (regarded by Saccardo as the imperfect stage of *D. eres*) appears to agree the best. Dr. Buisman's *Phomopsis* from elms in Holland [ibid., ix, p. 5] appears, from a cultural examination, to agree in the main with the Massachusetts canker-forming organism.

Elm disease: the present position.—*Scottish Forestry Journ.*, xlvi, 2, pp. 194–196, 2 maps, 1932.

For the fifth year in succession a survey on the status of the elm disease (*Graphium* [*Ceratostomella*] *ulmi*) in England has been prepared by the Forestry Commission [*R.A.M.*, xi, p. 336] and maps are given showing the distribution and relative intensity of the disease. During 1932 there was a marked decline in the virulence of attack in nearly every area visited, while the number of apparent 'recoveries' (in some of which, however, the fungus is still present) considerably exceeds the incidence of fresh cases. The disease has not been reported farther north than York in the east or Chester in the west, and is believed not to extend westward beyond Devon and the Welsh border. Only in the eastern counties, more particularly Suffolk and Essex, has the die-back assumed a really grave form. The Asiatic elm varieties showing resistance to the disease in Holland [ibid., xi, p. 485] are mostly too small to replace the English elm, for which other kinds of trees should be substituted wherever possible in the badly infected areas, since eradication is impracticable over such a wide area.

Buisman (Christine). **Over het voorkomen van Ceratostomella ulmi (Schwarz) Buisman in de natuur.** [On the occurrence of *Ceratostomella ulmi* (Schwarz) Buisman in nature.]—*Tijdschr. over Plantenziekten*, xxxviii, 9, pp. 203–204, 1932.

The perithecia of *Ceratostomella ulmi* [*R.A.M.*, xi, p. 409] developed in a moist, warm atmosphere on fragments of elm bark from diseased trees from various parts of Holland. Isolations showed that both the + and − strains of the fungus were almost universally present on trees infected by sap beetles [*Scolytus scolytus* and *S. multistriatus*] and bearing coremia of *Graphium*

ulmi. The perithecial stage of the fungus doubtless occurs in nature on severely diseased elms and the ascospores are probably conveyed, like the conidia, from tree to tree by insects.

Les maladies du Peuplier. [Diseases of the Poplar.]—*Bull. Soc. Centr. Forest. Belgique*, xxxix, 9, pp. 502–512, 1932.

In this paper [which appears to have been taken from a report of the 'Commission d'Étude des ennemis des arbres, des bois abattus, et des bois mis en œuvre (France)'], a brief account is given of the symptoms, incidence, and control of canker [*R.A.M.*, x, pp. 417, 567] and of the branch disease caused by *Dothichiza populea* [ibid., xi, p. 338] on poplars in France. Most of the information has already been noticed in this *Review* from other sources. Canker seems to have first appeared some fifty years ago in the valleys of the Ourcq, Grand and Petit Morin, but most of the diseased poplars have been destroyed, and at present it is found within a rather limited area, including the valley of the Oise and some neighbouring valleys, not extending farther north than Amiens.

Legislative and administrative measures. Spain.—*Internat. Bull. of Plant. Protect.*, vi, 10, pp. 164–167, 1932.

By a Decree of 16th June, 1932, containing regulations for the control of diseases and pests of the olive tree and rules for securing the efficient manufacture of olive oils, the Spanish Government require that chiefs of agronomic sections when informed of the occurrence of any such disease or pest shall inspect the attacked zone in order to determine the nature of the outbreak. The State will supply gratuitously the necessary fungicides and equipment to control leaf spot (*Cycloconium oleaginum*) [*R.A.M.*, x, p. 130] as well as an expert staff to give practical demonstrations of the treatment, after which growers must carry on the treatment on their own account. In conformity with regulations already in force, it is prohibited to sell insecticides and fungicides unless accompanied by a certificate showing that they have been tested and approved by the competent Government Service.

Amtliche Pflanzenschutzbestimmungen. Portugal. [Official plant protection regulations. Portugal.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, iv, 4, pp. 143–145, 1932.

Officials entrusted with the inspection of certified potatoes imported into Portugal must open 5 per cent. of the sealed consignments (completely emptying at least 1 per cent.) and inspect 5 per cent. of those arriving loose. The chief inspector must immediately be notified of any suspected cases of wart disease [*Synchytrium endobioticum*], and all consignments actually found to be so infected must be destroyed, or returned to their senders. Healthy consignments, i.e., those with under 5 per cent. decayed tubers, deep cuts, or other injuries (the lesions of *Actinomyces scabies* being reckoned only if involving one-tenth or more of the surface), will be furnished with properly authenticated certificates to this effect. Loose lots with more than 5 and less than 25 per cent. of decayed or injured tubers may be landed and placed in

special storage rooms under the authority of the Customs for sorting and destruction of the injured tubers, while those with over 25 per cent. of such defects must be totally destroyed.

Legislative and administrative measures. Latvia.—*Internat. Bull. of Plant Protect.*, vi, 10, p. 168, 1932.

Regulations published by the Latvian Administration of Agriculture on 25th April, 1932, require that any fungicide or insecticide intended for commercial sale must be submitted to official biological tests at the expense of the person concerned. The Faculty of Agriculture of the University of Latvia and the Plant Protection Institute are responsible for carrying out the tests, and a special committee will decide, on the basis of the results of these trials, whether or not the preparation tested may be placed on the market. On applying for a test the persons concerned must state in writing the composition of the product and must guarantee that this composition shall be maintained.

Legislative and administrative measures. Morocco (French Zone).—*Internat. Bull. of Plant Protect.*, vi, 10, pp. 168–169, 1932.

A Decree of the Director General of Agriculture, Commerce, and Land Settlement of the French Zone of Morocco dated 12th August, 1932, requires that any person selling sulphur for plant protection purposes must show on the delivery note, invoice, wrapper, container, or packing material and on the advertisements, posters, or price lists the degree of fineness of the sulphur calculated in French silk mesh. Sublimed sulphur or flowers of sulphur must contain at least 98·5 per cent. of pure sulphur, and not more than 0·5 per cent. of ash and the same of moisture. The proportion of crystals present must not exceed 12 per cent. Triturated or ground sulphur must contain at least 97 per cent. of crystalline sulphur, not more than 2 per cent. of ash and not more than 0·5 per cent. moisture. The pure sulphur content of precipitated sulphur must correspond to that guaranteed by the seller within a maximum variation of 2 per cent. The free sulphur content of other sulphur products such as native sulphur, black sulphur, cupric sulphur, &c., must be shown in accordance with the regulation above. Colloidal sulphur must be stable and without deposit and must be clear when diluted with distilled water. Its density at 20° C. and the degree of dilution at which it is to be used must be shown.